October 5, 1942

STEEL

PRODUCTION • PROCESSING • DISTRIBUTION • USE

IN TWO SECTIONS — ESTABLISHED 1882 — SECTION ONE

Bring your rolling mills up to Victory—and post-victory—standards. Redesign to put every roll on Timken Bearings.

From rougher to reel the strip moves swiftly, surely, accurately all along the line when back-up and work rolls turn on Timken Roll Neck Bearings.

Because of Timken pioneering in anti-friction bearings for mill roll necks more than 15 years ago, the American steel industry is finding it easier to keep pace with the urgent demands of today.

And when Victory has been won, the same roll neck bearings that have been piling up rolling records running into millions of tons for years past at the lowest average bearing cost per ton ever known, will go on and on saving time and money; enabling their operators to meet changed economic conditions confidently and successfully.

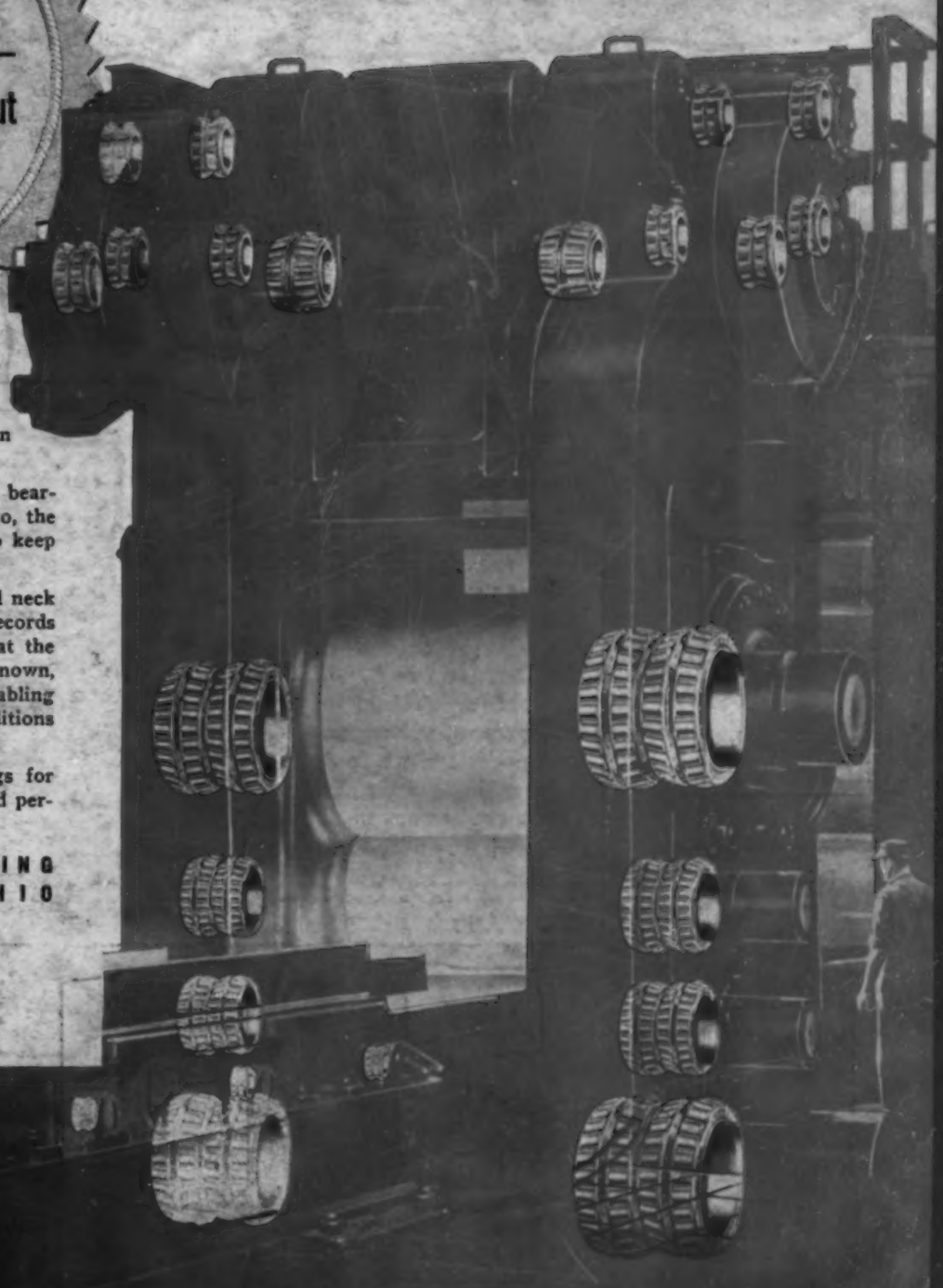
When you select Timken Roll Neck Bearings for new or existing mills you are assured of proved performance; you will not be taking chances.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



Industry's **FIRST CHOICE** *for over 40 years*

MAGNETIC CONTROL
Bulletin 921

WHEN buying cranes, many firms write *EC&M* into the specifications, because they can't afford a shutdown. They want control designed for CRANES and they know EC&M specializes in crane equipment and has made many outstanding contributions resulting in greatly improved crane performance.

On heavy-duty ladle and stripper cranes as well as on smaller-capacity cranes in machineshops, etc., EC&M Control has a reputation for continuity of service at low up-keep. For proven performance, highly satisfactory to the entire plant personnel, specify EC&M Control when cranes are purchased.

THE ELECTRIC CONTROLLER & MFG. CO.
CLEVELAND **OHIO**

EC&M Contributions in Crane Control

1. The first dynamic lowering control for hoists
2. The Wright Dynamic Lowering Circuit—a great improvement in hoist control
3. Time-Current Acceleration
4. Duplex and Quadruplex Control for 2 and 4-motor drives
5. Line-Arc Contactors
6. A-c Dynamic Lowering Control for A-c hoists
7. A-c Contra-torque Control for A-c hoists
8. Frequency Relay Control for A-c wound-rotor crane motors
9. The first Protective Panel for all motors on the crane
10. Type WB Brakes—the first with heavy-duty, brake blocks

MANUAL CONTROL
Bulletins
960-A, 972-A, and 980-A

SAFETY LIMIT STOPS
Bulletin 1035-C

PROTECTIVE PANELS
Bulletins 1021-C and 1022

TYPE WB BRAKES
Bulletin 1004-C

WHERE-TO-BUY *Products Directory* of STEEL ADVERTISERS

SECTION TWO
OCTOBER 5, 1942
ISSUED QUARTERLY

Additional copies
of this Products Directory
available on request

ABRASIVE WHEELS

Abrasive Co., Tacony & Fraley Sts., Philadelphia, Pa.
Atkins, E. C., & Co., 427 So. Illinois St., Indianapolis, Ind.
Bay State Abrasive Products Co., Westboro, Mass.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
DeSanno, A. P., & Sons, Inc., 436 Wheatland St., Phoenixville, Pa.
Macklin Co., Jackson, Mich.
Norton Co., Worcester, Mass.
Sterling Grinding Wheel Div. Cleveland Quarries Co., Tiffin, O.

ABRASIVES (Blast Cleaning)

American Foundry Equipment Co., The, 509 S. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., 4839 Harrison St., Pittsburgh, Pa.
Vapor Blast Mfg. Co., 333 S. 16th St., Milwaukee, Wis.

ABRASIVES (Coated Paper & Cloth)

Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul, Minn.

ABRASIVES (Polishing)

Abrasive Co., Tacony & Fraley Sts., Philadelphia, Pa.
Carborundum Co., The, Niagara Falls, N. Y.
Chicago Wheel & Manufacturing Co., 1101 W. Monroe St., Chicago, Ill.
General Abrasive Co., College Ave., & Hyde Park Blvd., Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

ACCUMULATORS

Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Elmes, Chas. F., Engineering Wks., 243 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Hydropress, Inc., 570 Lexington Ave., New York City.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

ACETYLENE

Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.

ACID-PROOF LININGS

Ceilcote Co., 750 Rockefeller Bldg., Cleveland, O.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.
National Carbon Co., W. 117th St. & Madison Ave., Cleveland, O.
Pennsylvania Salt Mfg. Co., Dept. S, Pensalt Cleaner Div. Philadelphia, Pa.

ACIDS (Pickling)

American Chemical Paint Co., Dept. 310, Ambler, Pa.
Pennsylvania Salt Mfg. Co., Dept. S, Pensalt Cleaner Div., Philadelphia, Pa.

ADHESIVES

Avery Adhesives, 451 E. 3rd St., Los Angeles, Cal.
Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul, Minn.

AEROCASING

Lakeside Steel Improvement Co., The, 5418 Lakeside Ave., Cleveland, O.

AIR COMRESSORS—See COMPRESSORS (Air)

AIR CONDITIONING EQUIPMENT

American Air Filter Co., 443 Central Ave., Louisville, Ky.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
General Electric Co. (Air Conditioning & Commercial Refrigeration Dept.) Bloomfield, N. J.
Lintern Corp., The, Lincoln Ave., Berea, O.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Worthington Pump & Machinery Corp., Harrison, N. J.

AIRCRAFT ACCESSORIES, PARTS, SUPPLIES

Elastic Stop Nut Corp., 2340A Vauxhall Rd., Union, N. J.
Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago, Ill.
Spriesch Tool & Mfg. Co., 10 Howard St., Buffalo, N. Y.
Steel and Tubes Div. Republic Steel Corp., 224 E. 131st St., Cleveland, O.

AIRLESS BLAST CLEANING EQUIPMENT

American Foundry Equipment Co., The 509 S. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Vapor Blast Mfg. Co., 333 S. 16th St., Milwaukee, Wis.

ALKALI CLEANING COMPOUNDS

American Chemical Paint Co., Ambler, Pa.
Detroit Rex Products Co., 13029 Hillview Ave., Detroit, Mich.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.

ALLOYS—See FERROALLOYS

ALLOYS (Corrosion & Abrasive Resistant)

Carpenter Steel Co., Reading, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Wall-Colmonoy Corp., 720 Fisher Bldg., Detroit, Mich.

ALLOYS (Heat Resistant)

Carpenter Steel Co., Reading, Pa.

ALLOYS (Magnesium)

Dow Chemical Co., Midland, Mich.

ANGLES, CHANNELS—See BEAMS, CHANNELS, ANGLES

ANNEALING (Tempering)

Lakeside Steel Improvement Co., The, 5418 Lakeside Ave., Cleveland, O.

ANNEALING BOXES—See BOXES (Annealing)

ANNEALING COVERS

General American Transportation Corp., 135 S. LaSalle St., Chicago, Ill.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

ANODES (All Types)

Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

ANODES (Nickel)

Seymour Manufacturing Co., The, Seymour, Conn.
Udylite Corp., The 1651 E. Grand Blvd., Detroit, Mich.

AXLES

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

BABBITT METAL

Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

BALANCING MACHINES

Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.

BALING PRESSES

Galland-Henning Manufacturing Co., 2747 S. 31st St., Milwaukee, Wis.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Standard Machinery Co., Providence, R. I.

BALL TRANSFERS

Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

BALLS (Brass or Bronze) (*Also Stainless)

*Atlas Ball Div. SKF Industries, Inc., Philadelphia, Pa.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Strom Steel Ball Co., 1850 S. 54th Ave., Cicero, Ill.

BALLS (Special Alloy Metals)

Atlas Ball Div. SKF Industries, Inc., Philadelphia, Pa.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

BALLS (Steel) (*Also Stainless)

*Atlas Ball Div. SKF Industries, Inc., Philadelphia, Pa.
*Strom Steel Ball Co., 1850 S. 54th Ave., Cicero, Ill.

BAND FILES (Metal)

Continental Machines, Inc., 1324 S. Washington Ave., Minneapolis, Minn.

BAND SAWS (Metal Cutting)

Continental Machines, Inc., 1324 S. Washington Ave., Minneapolis, Minn.
Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Walker-Turner Co., Inc., 50102 Berckman St., Plainfield, N. J.
Wells Mfg. Co., Three Rivers, Mich.

BANDS—See HOOPS AND BANDS

BANDS (Iron and Steel)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

BAR BENDERS

Kardong Bros. Inc., 346 Buchanan St., Minneapolis, Minn.

BARGE MOVERS

Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

BARGES (Steel)

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Dravo Corp. (Engin'r'g Works Div.) Neville Island, Pittsburgh, Pa.
Federal Shipbuilding & Dry Dock Co., Kearny, N. J.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Maryland Dry Dock Co., Baltimore, Md.

BARGES (Wood)

Koppers Co., Wood Preserving Div., 300 Koppers Bldg., Pittsburgh, Pa.

BARREL DUMPERS

Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.

BARRELS (Plating)

Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

BARRELS (Steel)

Pressed Steel Tank Co., 1461 S. 66th St., Milwaukee, Wis.

BARRELS (Tumbling)

Ransohoff, N., Inc., Elmwood Place, Cincinnati, Ohio.

BARS

Kloster Steel Co., 224 N. Justine St., Chicago, Ill.

BARS (Alloy)

Allegheny Ludlum Steel Corp., 2319 Oliver Building (22) Pittsburgh, Pa.
Ampco Metal, Inc., Dept. S-10, 3830 W. Burnham St., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Reading, Pa.
Columbia Steel Co., San Francisco, Calif.
Copperweld Steel Co., Warren, O.
Firth-Sterling Steel Co., McKeesport, Pa.
International Nickel Co. Inc., The, 67 Wall Street, New York City.
*Kloster Steel Corp., 224-228 N. Justine St., Chicago, Ill.
LaSalle Steel Co., Chicago, Ill.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Wyckoff Drawn Steel Co., 1st National Bank Bldg., Pittsburgh, Pa.

BARS (Brass, Bronze or Copper)

American Brass Co., The, Waterbury, Conn.
Copperweld Steel Co., Warren, O.
Johnson Bronze Co., 550 S. Mill St. New Castle, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Shenango-Penn Mold Co., Dover, Ohio.

BARS (Concrete Reinforcing)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

BARS (Concrete Reinforcing)—Con.

Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

BARS (Iron)—See IRON (Bar)

BARS (Steel)
(*Also Stainless)

*Allegheny Ludlum Steel Corp., 2319 Oliver Bldg., (22) Pittsburgh, Pa.
*Bethlehem Steel Co., Bethlehem, Pa.
*Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
*Carpenter Steel Co., Reading, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
*Copperweld Steel Co., Warren, O.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
*Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Kloster Steel Corp., 224-228 N. Justine St., Chicago, Ill.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
Purdy, A. B., Co., Inc., 792 Greenwich St., New York City.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
*Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

BATHS (Heat Treating-High Speed)

Holden, A. F., Co., The, 200 Winchester Ave., New Haven, Conn.

BATHS (Heat Treating, Cyanide, Salt)

Mahr Mfg. Co., Minneapolis, Minn.

BATTERIES (Storage)

Edison Storage Battery Div. of Thomas A. Edison, Inc., West Orange, N. J.
Electric Storage Battery Co., The, 19th St. and Allegheny Ave., Philadelphia, Pa.
Graybar Electric Co., 420 Lexington Ave., New York City.

BATTERY CHARGING APPARATUS

Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.

BEAMS, CHANNELS, ANGLES ETC.
(*Also Stainless)

Bethlehem Steel Co., Bethlehem, Pa.
*Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Dow Chemical Co., Midland, Mich.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Levinson Steel Co., The, 33 Pride St., Pittsburgh, Pa.
*Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

BEARINGS (Ball)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.
Marlin-Rockwell Corp., 402 Chandler St., Jamestown, N. Y.
New Departure Div., General Motors Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Torrington Co., The, Torrington, Conn.

BEARINGS (Babbitt)

Johnson Bronze Co., 550 S. Mill St., New Castle, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

BEARINGS (Brass, Bronze)

Ampco Metal, Inc., Dept. S-10, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
Johnson Bronze Co., 550 S. Mill St., New Castle, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., 401 W. Third St., Dover, O.

BEARINGS (Graphite)

National Carbon Co., W. 117th St. & Madison Ave., Cleveland, Ohio.
United States Graphite Co., The, Saginaw, Mich.

BEARINGS (Journal)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Corp., Harrison, N. J.
Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Rollway Bearing Co., Inc., 541 Seymour Ave., Syracuse, N. Y.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Needle)

Bantam Bearings Corp. South Bend, Indiana.
Torrington Co., The, Torrington, Conn.

BEARINGS (Non-Metallic)

Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

BEARINGS (Oilless)

Johnson Bronze Co., Mill St., New Castle, Pa.
Rhoades, R. W., Metaline Co., 50-17 Fifth St., Long Island City, N. Y.

BEARINGS (Quill)

Bantam Bearings Corp., South Bend, Ind.

BEARINGS (Radial)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Indiana.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
New Departure Div., General Motors Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Rollway Bearing Co., Inc., 541 Seymour Ave., Syracuse, N. Y.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Roll Neck)

Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Morgan Construction Co., Worcester, Mass.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Rollway Bearing Co., Inc., 541 Seymour Ave., Syracuse, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave. Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Rolle)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Rollway Bearing Co., Inc., 541 Seymour Ave., Syracuse, N. Y.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Standard Machinery Co., Providence, R. I.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Roller Tapered)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Indiana.
Rollway Bearing Co., Inc., 541 Seymour Ave., Syracuse, N. Y.

BEARINGS (Rolling Mill)

American Roller Bearing Co., 416 Melwood St., Pittsburgh, Pa.
Bantam Bearings Corp., South Bend, Ind.
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.
Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.
Morgan Construction Co., Worcester, Mass.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS (Sealed)

Norma-Hoffmann Bearings, Corp., Stamford, Conn.

BEARINGS (Shaft Hangers)

Norma-Hoffmann Bearings Corp., Stamford, Conn.
Rollway Bearing Co., Inc., 541 Seymour Ave., Syracuse, N. Y.

BEARINGS (Thrust)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Rollway Bearing Co., Inc., 541 Seymour Ave., Syracuse, N. Y.
SKF Industries, Inc., Front St., and Erie Ave., Philadelphia, Pa.
Timken Roller Bearing Co., The, Canton, O.

BELTING (Chain and Link)

Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

BELTING (Metal, Conveyor, High and Low Temperature)

Cyclone Fence Div. American Steel & Wire Co., Waukegan, Ill.

BENDING AND STRAIGHTENING MACHINES

Alliance Machine Co., The, Alliance, O.
American Foundry Equipment Co., The, Mishawaka, Ind.
Cleveland Crane & Engineering Co., The, Steelweld Machinery Div., The, 1125 E. 283rd St., Wickliffe, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Kardong Bros., Inc., 346 Buchanan St., Minneapolis, Minn.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
O'Neil-Irwin Mfg. Co., 304 8th Ave. S., Minneapolis, Minn.
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.
Webb Corp., The, Webb City, Mo.

BENZOL AND TOLUOL RECOVERY PLANTS

Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The Youngstown, O.

BILLETS (Alloy and Carbon Steel)

Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Firth-Sterling Steel Co., McKeesport, Pa.
Keystone Steel & Wire Co., Dept. AC, Peoria, Ill.
Kloster Steel Corp., 224-228 N. Justine St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.

BILLETS (Forging)

Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Reading, Pa.
Copperweld Steel Co., Warren, O.
Heppenstall Co., Box S-9, 4620 Hatfield St., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.

BILLETS AND BLOOMS
(*Also Stainless)

*Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
*Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Steel Corp., Kokomo, Ind.
*Copperweld Steel Co., Warren, O.
*Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The Steel & Tube Div., Canton, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

BLACKING (Graphite)

United States Graphite Co., The, Saginaw, Mich.

BLAST CLEANING EQUIPMENT (Sand)

American Foundry Equipment Co., The 509 S. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Vapor Blast Mfg. Co., 333 S. 16th St., Milwaukee, Wis.

BLAST FURNACE AIR CONDITIONING

Koppers Co., Engineering & Construction Div., 300 Koppers Bldg., Pittsburgh, Pa.
Pritchard, J. F., & Co., Dwight Bldg., Kansas City, Mo.
Surface Combustion Div. of General Properties Co., Inc., 2375 Dorr St., Toledo, O.

BLAST FURNACE CLEANING (Gas)

McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Peabody Engineering Corp., 580 Fifth Ave., New York City.

BLAST FURNACE HOT BLAST STOVES

McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.

BLAST FURNACE SPECIALTIES

Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Hays Corp., The, Michigan City, Ind.
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Pritchard, J. F., & Co., Dwight Bldg., Kansas City, Mo.

BLAST FURNACE STOCK HOUSES

McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.

BLAST FURNACES—See FURNACES (Blast)

BLOCKS (Chain)

Reading Chain & Block Corp., Dept. D-10, Reading, Pa.

BLOWERS

General Electric Co., Schenectady, N. Y.
Mahr Mfg. Co., Minneapolis, Minn.
North American Mfg. Co., The, 2910 E. 75th St., Cleveland, O.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

BLOWPIPES (Oxy-Acetylene)

Linde Air Products Co., The, 30 E. 42nd St., New York City.

BLUE PRINTING MACHINES AND ACCESSORIES

Wickes Brothers, Saginaw, Mich.

BOILER HEADS

Bethlehem Steel Co., Bethlehem, Pa.

BOILERS (Water Tube)

Babcock & Wilcox Co., The, 85 Liberty St., New York City.

BOILER TUBES—See TUBES (Boiler)

BOILERS

Oil Well Supply Co., Dallas, Texas.

BOLT AND NUT MACHINERY

Landis Machine Co., Waynesboro, Pa.
National Machinery Co., The, Tiffin, O.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

BOLTS (*Also Stainless)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Columbia Steel Co. San Francisco, Calif.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Oliver Iron & Steel Corp., S. 10th & Muriel Sts., Pittsburgh, Pa.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
*Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

BOLTS (Carriage and Machine)

Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

BOLTS (Non-Ferrous and Stainless)

Harper, H. M., Co., The, 2646 Fletcher St., Chicago, Ill.

BOLTS (Special)

Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS (Stove)

Central Screw Co., 3517 Shields Ave., Chicago, Ill.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

BOLTS (Stove, Recessed Head)

American Screw Co., Providence, R. I.
Bristol Co., Waterbury, Conn.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

BOLTS (Track)—See TRACK BOLTS

BORING MACHINES (Precision)

Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Heald Machine Co., Worcester, Mass.
Ohio Machine Tool Co., The, Kenton, O.
Sellers, William, & Co., Inc., 16th & Callowhill Sts., Philadelphia, Pa.

BORING MACHINES (Special)

Van Norman Machine Tool Co., Springfield, Mass.

BORING MILLS (Vertical)

Bullard Co., The, Bridgeport, Conn.

BORING TOOLS (Carbide Tipped)

Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

BOXES (Annealing)

Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co E. Chicago, Ind.
General American Transportation Corp., 135 S. LaSalle St., Chicago, Ill.
Mesta Machine Co., P. O., Box 1466, Pittsburgh, Pa.
National-Erie Corp., Erie, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Union Steel Casting Div. of Blaw-Knox Co., 62nd & Butler Sts., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.
Wilson, Lee, Engineering Co., 20005 Lake Rd., Cleveland, O.

BOXES (Open Hearth Charging)

Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Mesta Machine Co., P. O., Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

BOXES-SHOP (Steel)

American Metal Works, Inc., 1515 Germantown Ave., Philadelphia, Pa.

BOXES-STEEL (Stacking)

American Metal Works, Inc., 1515 Germantown Ave., Philadelphia, Pa.

BRAKE LININGS

Johns-Manville Corp., 22 E. 40th St., New York City.
Wellman, The S. K., Co., 1374 E. 51st St., Cleveland, O.

BRAKES (Electric)

Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2698 E. 79th St., Cleveland, O.

BRAKES (Hand)

O'Neil-Irwin Mfg. Co., 304 8th Ave. So., Minneapolis, Minn.

BRAKES (Press)

Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Crane & Engineering Co., The, Steelweld Machinery Div., The, 1125 E. 283rd St., Wickliffe, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Ferracute Machine Co., Bridgeton, N. J.

BRICK (Abrasive)

Chicago Wheel & Manufacturing Co., 1101 W. Monroe St., Chicago, Ill.

BRICK (Acid Resisting)

Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.
National Carbon Co., W. 117th St. & Madison Ave., Cleveland, O.

BRICK (Chrome)

Harbison-Walker Refractories Co., 1800 Farmers Bank Bldg., Pittsburgh, Pa.

BRICK (Fire Clay)

Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

BRICK (Forsterite)

Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

BRICK (High Alumina)

Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

BRICK (Insulating)—See INSULATING BRICK

BRICK (Ladle)

Globe Brick Co., The, East Liverpool, O.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

BRICK (Magnesia)

Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

BRICK (Refractory)—See REFRACTORIES, CEMENT, ETC.

BRICK (Silica)

Harbison-Walker Refractories Co., 1800 Farmers Bank Bldg., Pittsburgh, Pa.

BRICK (Silicon Carbide)

Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., The, Perth Amboy, N. J.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.
Norton Co., Worcester, Mass.

BRICK (Sleeves, Nozzles, Runners, Tuyeres)

Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

BRIDGE CRANES (Ore and Coal Handling)—See CRANES—BRIDGE (Ore & Coal Handling)

BRIDGES, BUILDINGS, VIADUCTS, STACKS, ETC.

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Blaw-Knox Co., Blawnox, Pa.
Columbia Steel Co., San Francisco, Calif.
General American Transportation Corp., 135 S. LaSalle St., Chicago, Ill.

BRIDGES, BUILDINGS, VIADUCTS, STACKS, etc.—Con.

Levinson Steel Co., The, 33 Pride St., Pittsburgh, Pa.
Robertson, H. H. Co., Farmers Bank Bldg., Pittsburgh, Pa.

BROACHING CUTTERS

Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

BROACHING MACHINES

Cincinnati Milling Machine Co., Cincinnati, O.
Colonial Broach Co., 147 Jos. Campau, Detroit, Mich.

BRUSHES

Fuller Brush Co., The, Hartford, Conn.

BRUSHES (Carbon)

National Carbon Co., W. 117th St., & Madison Ave., Cleveland, O.
United States Graphite Co., The, Saginaw, Mich.

BRUSHES (Industrial)

Fuller Brush Co., The, Hartford, Conn.

BRUSHES (Steelgript)

Fuller Brush Co., The, Hartford, Conn.

BUCKETS (Clam Shell, Dragline, Grab, Single Line)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Blaw-Knox Co., Blawnox, Pa.
Cullen-Friestedt Co., 1308 S. Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Osgood Co., The, Marion, O.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

BUCKETS (Single Hook, Automatic Dump, Automatic Single Line)

Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

BUFFERS (Electric Portable)

Chicago Wheel & Manufacturing Co., 1101 W. Monroe St., Chicago, Ill.

BUILDINGS (Steel)—See BRIDGES BUILDINGS, ETC.

BULLDOZERS

Beatty Machine & Mfg. Co., Hammond, Ind.
Hanniffin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BURNERS (Acetylene)—See TORCHES AND BURNERS

BURNERS (Automatic)

Bloom Engineering Co., 916 Behan St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
North American Mfg. Co., The, 2910 E. 75th St., Cleveland, O.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Surface Combustion Div. of General Properties Co., Inc., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 20005 Lake Rd., Cleveland, O.

BURNERS (Coal, Oil, Gas, Combination)

American Gas Furnace Co., Elizabeth, N. J.
Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Bloom Engineering Co., 916 Behan St., Pittsburgh, Pa.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Machler, Paul, Co., The, 2208 W. Lake St., Chicago, Ill.
Mahr Mfg. Co., Minneapolis, Minn.
North American Mfg. Co., The, 2910 E. 75th St., Cleveland, O.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Surface Combustion Div. of General Properties Co., Inc. 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 20005 Lake Rd., Cleveland, O.

BUSHINGS (Bronze)

Ampco Metal, Inc., Dept. S-10, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
Johnson Bronze Co., 550 S. Mill St., New Castle, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., 401 W. Third St., Dover, O.

BUSHINGS (Jig)

Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

BUSHINGS (Oilless)

Rhoades, R. W., Metaline Co., 50-17 Fifth St., Long Island City, N. Y.

BY-PRODUCT PLANTS

Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

CABINETS (Refrigeration)

General Electric Company (Air Conditioning & Commercial Refrigeration Dept.), Bloomfield, N. J.

CABINETS (Steel)

Republic Steel Corp., Berger Mfg. Div., Canton, O.

CADMIUM

Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

CADMIUM PLATING PROCESS

Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

CALCIUM METAL AND ALLOYS

Electro Metallurgical Co., 30 E. 42nd St., New York City.

CAISSONS (Pneumatic)

Dravo Corp., (Contracting Div.), Neville Island, Pittsburgh, Pa.

CAP SCREWS—See SCREWS (Cap, Set, Safety-Set)

CAPSTANS (Electric, Gasoline, Diesel)

Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

CAR DUMPERS

Alliance Machine Co., The, Alliance, O.
Industrial Brownhoist Corp., Bay City, Mich.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

CAR PULLERS and SPOTTERS

American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Cullen-Friestedt Co., 1308 S. Kilbourn Ave., Chicago, Ill.
Diamond Iron Works, Inc., Minneapolis, Minn.
Link-Belt Co., 2410 W. 18th St., Chicago, Ill.
Silent Hoist Winch and Crane Co., 849 63rd St., Brooklyn, N. Y.

CARBIDE

Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Carbide Corp., 60 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.

CARBIDE (Special Parts)

Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

CARBIDE TOOLS (Steel Cutting)

Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

CARBON SPECIALTIES

United States Graphite Co., The, Saginaw, Mich.

CARBURIZING (Pack or Gas)

Lakeside Steel Improvement Co., The, 5418 Lakeside Ave., Cleveland, O.

CARS (Charging)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.
Pollock, Wm. B. Co., The, 101 Andrews Ave., Youngstown, O.

CARS (Dump)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Easton Car & Construction Co., Easton, Pa.

CARS (Hot Metal Transfer)

Bartlett Hayward Div., Koppers Co., Baltimore, Md.

CARS (Industrial and Mining)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Easton Car & Construction Co., Easton, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

CARS (Scale)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.

CASTING WASHER EQUIPMENT

Pangborn Corp., Hagerstown, Md.

CASTINGS (Acid Resisting)

Ampco Metal. Inc., Dept. S-10, 3830 W. Burnham St., Milwaukee, Wis.
Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Lebanon Steel Foundry, Lebanon, Pa.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., 401 W. Third St., Dover, O.

CASTINGS (Alloy Iron)

National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.

CASTINGS (Alloy Steel)

Allegheny Ludlum Steel Corp., 2319 Oliver Building (22) Pittsburgh, Pa.
Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Electro Alloys Co., The, Elyria, O.
Erie Forge Co., W. 15th & Cascade Sts., Erie, Pa.
Lebanon Steel Foundry, Lebanon, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Michiana Products Co., Michigan City, Ind.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
National-Erie Corp., Erie, Pa.
Ohio Steel Foundry Co., Lima, O.-Springfield, O.
Pittsburgh Rolls Div., Blaw-Knox Co., Pittsburgh, Pa.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Union Steel Castings Div. of Blaw-Knox Co., 62nd & Butler Sts., Pittsburgh, Pa.
United Engineering & Foundry Co., 1st National Bank Bldg., Pittsburgh, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Aluminum, Brass, Bronze, Copper)

Ampco Metal, Inc., Dept. S-10, 3830 W. Burnham St., Milwaukee, Wis.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
Century Foundry Co., 3727 Market St., St. Louis, Mo.
Grinnell Co., Inc., Providence, R. I.
Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.
Johnson Bronze Co., Mill St., New Castle, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., 401 W. Third St., Dover, O.

CASTINGS (Corrosion Resisting)

Lebanon Steel Foundry, Lebanon, Pa.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
Wall-Colmonoy Corp., 720 Fisher Bldg., Detroit, Mich.

CASTINGS (Electric Steel)

Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Erie Forge Co., W. 15th & Cascade Sts., Erie, Pa.
Lebanon Steel Foundry, Lebanon, Pa.
National-Erie Corp., Erie, Pa.
Reading Steel Casting Div. of American Chain & Cable Co. Inc., Reading, Pa.
West Steel Casting Co., The, 805 E. 70th St., Cleveland, O.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Gray Iron, Alloy or Semi-Steel)

American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Brown, Inc., 456 So. Main St., Lima, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Century Foundry Co., 3727 Market St., St. Louis, Mo.
Columbia Steel Co., San Francisco, Calif.
Diamond Iron Works, Inc., Minneapolis, Minn.

CASTINGS (Gray Iron, Alloy or Semi Steel)—Con.

Erie Foundry Co., Erie, Pa.
Grinnell Co., Inc., Providence, R. I.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Oil Well Supply Co., Dallas, Texas.
Shenango-Penn Mold Co., 401 W. Third St., Dover, O.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

CASTINGS (Heat Resisting)

Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Electro Alloys Co., The, Elyria, O.
International Nickel Co. Inc., The, 67 Wall Street, New York City.
Lebanon Steel Foundry, Lebanon, Pa.
Michiana Products Co., Michigan City, Ind.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Alloy Steel Div. of Blaw-Knox Co., Blawnox, Pa.
Shenango-Penn Mold Co., 401 W. Third St., Dover, O.

CASTINGS (Malleable)

American Chain Div. American Chain & Cable Co., Inc., York, Pa.
American Chain & Cable Co. Inc., Bridgeport, Conn.
Grinnell Co., Inc., Providence, R. I.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CASTINGS (Steel) (*Also Stainless)

*Allegheny Ludlum Steel Corp., 2319 Oliver Bldg., (22) Pittsburgh, Pa.
Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Roll & Steel Fdry Co., E. Chicago, Ind.
Erie Forge Co., W. 15th & Cascade Sts., Erie, Pa.
*Lebanon Steel Foundry, Lebanon, Pa.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Mackintosh-Hemphill Co., 9th & Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Michiana Products Co., Michigan City, Ind.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry., Lima, O.-Springfield, O.
Oil Well Supply Co., Dallas, Texas.
Pittsburgh Rolls, Div. of Blaw-Knox Co., Pittsburgh, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Steel Founders' Society of America, 720 Midland Bldg., Cleveland, O.
Strong Steel Fdry. Co., Hertel & Norris Aves., Buffalo, N. Y.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Steel Casting Div. of Blaw-Knox Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
West Steel Casting Co., The, 805 E. 70th St., Cleveland, O.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Wear Resisting)

Hagan, George J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Lebanon Steel Foundry, Lebanon, Pa.
Link-Belt Co 220 S. Belmont Ave., Indianapolis, Ind.
Shenango-Penn Mold Co., 401 W. Third St., Dover, O.
Wall-Colmonoy Corp., 720 Fisher Bldg., Detroit, Mich.

CASTINGS (Worm and Gear Bronze)

Ampco Metal, Inc., Dept. S-10, 3830 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 2816 Smallman St., Pittsburgh, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

CEMENT (Acid Proof)

National Carbon Co., W. 117th St. & Madison Ave., Cleveland, O.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.

CEMENT (Elastic)

Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul, Minn.

CEMENT (High Temperature)

Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., The, Perth Amboy, N. J.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa. Pittsburgh, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.
Norton Company, Worcester, Mass.

CEMENT (High Temperature Hydraulic)

Atlas Lumnite Cement Co. Dept. S, Chrysler Bldg., New York City.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

CENTRAL STATION EQUIPMENT

Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa

CHAIN (Conveyor and Elevator)

Link-Belt Co., 220 S. Belmont Ave. Indianapolis, Ind.

CHAIN (Draw Bench)

Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Malleable)

Lake Chain Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Power Transmission)

Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Roller)

Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Sprocket)

Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Steel-Finished Roller)

Link-Belt Co., 220 S. Belmont Ave. Indianapolis, Ind.

CHARGING MACHINES (Cupola)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES (Open Hearth)

Morgan Engineering Co., The, Alliance, O.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.

CHARGING MACHINES AND MANIPULATORS (Autofloor Type)

Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

CHECKER BRICK

Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

CHECKS (Metal)

Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.
Matthews, James H., & Co., 3978 Forbes St., Pittsburgh, Pa.

CHEMICALS (Industrial)

Metal & Thermit Corp., 120 Broadway, New York City.
Park Chemical Co., 8076 Military Ave., Detroit, Mich.
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.
Turco Products, Inc., 6135 S. Central Ave., Los Angeles, Calif.

CHROME MORTAR

Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

CHROME ORE

Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

CHROMIUM METAL AND ALLOYS

Electro Metallurgical Co., 30 E. 42nd St., New York City.
Metal & Thermit Corp., 120 Broadway, New York City.
Vanadium Corp., of America, 420 Lexington Ave., New York City.

CHROMIUM PLATING PROCESS

United Chromium, Inc., 51 E. 42nd St., New York City.

CHUCK OPERATING CYLINDERS

Anker-Holth Mfg. Co.—Airgrip Chuck Div., 332 S. Michigan Ave., Chicago, Ill.

CHUCKING MACHINES (Multiple Spindle)

Bullard Co., The, Bridgeport, Conn.
National Acme Co., The, 170 E. 131st St., Cleveland, O.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

CHUCKS

Bullard Co., The, Bridgeport, Conn.

CHUCKS (Automatic Closing)

Anker-Holth Mfg. Co.—Airgrip Chuck Div., 332 S. Michigan Ave., Chicago, Ill.

CLAMPS (Drop Forged)

Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

CLEANERS (Steam)

Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.

CLEANING EQUIPMENT (Metal)

American Foundry Equipment Co., The, Mishawaka, Ind.
Bullard Co., The, Bridgeport, Conn.
Detroit Rex Products Co., 13029 Hillview Ave., Detroit, Mich.
Pangborn Corporation Hagerstown, Md.
Ransohoff, N., Inc., Elmwood Place Cincinnati, O.
Salem Engineering Co., 714 S. Broadway, Salem, O.

CLEANING SPECIALTIES

American Chemical Paint Co., Dept. 310, Ambler, Pa.
Detroit Rex Products Co., 13029 Hillview Ave., Detroit, Mich.
MacDermid, Inc., Waterbury, Conn.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.
Turco Products, Inc., 6135 S. Central Ave., Los Angeles, Calif.

CLUTCH FACINGS

Wellman, The S. K., Co., 1374 East 51st St., Cleveland, O.

CLUTCHES (Friction)

Diamond Iron Works, Inc., Minneapolis, Minn.
Jones, W. A., Fdry. & Mach. Co., 4437 Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

CLUTCHES (Magnetic)

Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

COAL OR COKE

Alan Wood Steel Co., Conshohocken, Pa.
Cleveland-Cliffs Iron Co., The, Union Commerce Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Koppers Co., Gas & Coke Div., 300 Koppers Bldg., Pittsburgh, Pa.
Koppers Coal Div., Eastern Gas & Fuel Assoc., 300 Koppers Bldg., Pittsburgh, Pa.
New England Coal & Coke Co., Boston, Mass.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

COAL, COKE, ORE AND ASH HANDLING MACHINERY

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Easton Car & Construction Co., Easton, Pa.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Koppers Co., Engineering & Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COILS (Direct Expansion)

General Electric Company (Air Conditioning & Commercial Refrigeration Dept.), Bloomfield, N. J.

COILS (Water, Steam)

General Electric Company (Air Conditioning & Commercial Refrigeration Dept.), Bloomfield, N. J.

COKE—See COAL or COKE

COKE OVEN MACHINERY

Alliance Machine Co., The, Alliance, O.
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Koppers Co., Engineering & Construction Div., 300 Koppers Bldg., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.

COKE OVENS (By-Product)

Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

COLUMBIUM

Electro Metallurgical Co., 30 E. 42nd St., New York City.

COMBUSTION BULBS

Norton Company, Worcester, Mass.

COMBUSTION CONTROLS

Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Morgan Construction Co., Worcester, Mass.
Norton Company, Worcester, Mass.

COMPARATORS (Optical)

Jones & Lamson Machine Co., Springfield, Vt.

COMPENSATORS (Automatic)

Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.

COMPOUNDS (Case Hardening, Heat Treating, Polishing)

Park Chemical Co., 8076 Military Ave., Detroit, Mich.

COMPOUNDS (Coppering, Metal Finishing, Rust Removing, Rust Preventing)

American Chemical Paint Co., Ambler, Pa.

COMPRESSORS (Air)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Cooper-Bessemer Corp., The, Mt. Vernon, O.
Curtis Pneumatic Machinery Div. of Curtis Mfg. Co., 1996 Kienlen Ave., St. Louis, Mo.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONCRETE (Heat Resistant)

Atlas Lumnite Cement Co., Dept. S, Chrysler Bldg., New York City.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

CONCRETE REINFORCING BARS —See BARS (Concrete Reinforcing)

CONDENSERS (Surface, Barometric, Multi-Jet)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Company (Air Conditioning & Commercial Refrigeration Dept.), Bloomfield, N. J.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National Carbon Co., W. 117th St. & Madison Ave., Cleveland, Ohio.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONDUITS (Electric)

General Electric Co., Schenectady, N. Y.
Steel and Tubes Div., Republic Steel Corp., Cleveland, Ohio.
Younstown Sheet & Tube Co., The, Youngstown, O.

CONDUITS (Pressure-Treated Wood)

Koppers Co., Wood Preserving Div., 300 Koppers Bldg., Pittsburgh, Pa.

CONNECTING RODS

Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., Box S-9, 4620 Hatfield St., Pittsburgh, Pa.
Kropp Forge Co., 3301 W. Roosevelt Rd., Chicago, Ill.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.

CONTACTS & CONTACTORS (Electrical)

Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2698 E. 79th St., Cleveland, O.
Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.
National Carbon Co., W. 117th St. & Madison Ave., Cleveland, O.

CONTROL EQUIPMENT (Electric)

General Electric Co., Schenectady, N. Y.

CONTRACT WORK

Commercial Metals Treating, Inc., Toledo, O.
Kirk & Blum Mfg. Co., 2822 Spring Grove Ave., Cincinnati, O.
Nilson, A. H., Machine Co., Inc., Bridgeport, Conn.
Norlipp Co., The, 556 W. Congress St., Chicago, Ill.
North Wales Machine Co., Inc., North Wales, Pa.

CONTRACTORS—See ENGINEERS AND CONTRACTORS

CONTROL SYSTEMS (Automatic)

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hays Corp., The, Michigan City, Ind.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

CONTROLLERS (Electric)

Allen-Bradley Co., 1320 S. Second St., Milwaukee, Wis.
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

CONTROLS (Combustion)—See COMBUSTION CONTROLS

CONTROLS (Temperature)

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hays Corp., The, Michigan City, Ind.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

CONVEYING SYSTEMS (Steam Jet)

Hagan, George J., Co., 2400 E. Carson St., Pittsburgh, Pa.

CONVEYOR BELTS (Wire)

Cyclone Fence Div., American Steel & Wire Co., Waukegan, Ill.

CONVEYORS (Apron)

Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Belt)

Bartlett, C. O., & Snow Co., 6200 Harvard Ave., Cleveland, O.
Diamond Iron Works, Inc., Minneapolis, Minn.

CONVEYORS (Chain)

Bartlett, C. O. & Snow Co., 6200 Harvard Ave., Cleveland, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Elevating)

Bartlett, C. O. & Snow Co. 6200 Harvard Ave., Cleveland, O.
Diamond Iron Works, Inc., Mineapolis, Minn.
Farquhar, A. B., Co., Ltd., York, Pa.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Overhead Trolley)

American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Reading Chain & Block Corp., Dept. D-10, Reading, Pa.

CONVEYORS (Roller—Power and Gravity)

Bartlett, C. O. & Snow Co., 6200 Harvard Ave., Cleveland, O.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.

COPPER (Phosphorized)

National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Revere Copper & Brass, Inc. 230 Park Ave., New York City.

CORE WASH

United States Graphite Co., The, Saginaw, Mich.

COTTER PINS

American Chain Div., American Chain & Cable Co., Inc., York, Pa.
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

COUNTERBORES

Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

COUPLINGS (Air Hose)

Hansen Manufacturing Co., The, 1786 East 27th St., Cleveland, O.

COUPLINGS (Flexible)

American Flexible Coupling Div., J. A. Zurn Mfg. Co., 18th & Pittsburgh Aves., Erie, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
Foote Bros. Gear & Machine Co., 5301 S. Western Blvd., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
Lovejoy Flexible Coupling Co., 4973 W. Lake St., Chicago, Ill.
Philadelphia Gear Works, Erie Ave. & G. St., Philadelphia, Pa.
Poole Fdy. & Mach. Co., Woodberry St., Baltimore, Md.
Waldron, John, Corp., New Brunswick, N. J.

COUPLINGS (Pipe)

Bethlehem Steel Co., Bethlehem, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.
Republic Steel Corp., Dept. ST, Cleveland, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

CRANES, BRIDGE (Ore and Coal Handling)

Alliance Machine Co., The Alliance, O.
Dravo Corp. (Engineering Works Div.), Neville Island, Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Manning, Maxwell & Moore, Inc., Shaw Box Crane & Hoist Div., Muskegon, Mich.

CRANES (Charging)

Alliance Machine Co., The, Alliance, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Crawler, Erection)

Bucyrus-Erie Corp., South Milwaukee, Wis.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Hughes-Keenan Co., 585 Newman St., Mansfield, O.
Industrial Brownhoist Corp., Bay City, Mich.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.
Osgood Co., The, Marion, O.

CRANES (Electric)

Alliance Machine Co., The, Alliance, O.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Chicago Tramrail Co., 2910 W. Carroll Ave., Chicago, Ill.
Cleveland Crane & Engineering Co., The, 1125 E. 283rd St., Wickliffe, O.
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Manning, Maxwell & Moore, Inc., Shaw-Box Crane & Hoist Div., 406 Broadway, Muskegon, Mich.
Morgan Engineering Co., The, Alliance, O.
Reading Chain & Block Corp., Dept. D-10, Reading, Pa.
Shepard Niles Crane & Hoist Corp. 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Gantry)

Alliance Machine Co., The, Alliance, O.
Cleveland Crane & Engineering Co., The, 1125 E. 283rd St., Wickliffe, O.
Cullen-Friestedt Co., 1308 S. Kilbourn Ave., Chicago, Ill.
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Manning, Maxwell & Moore, Inc., Shaw Box Crane & Hoist Div., Muskegon, Mich.
Morgan Engineering Co., The, Alliance, O.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.
Reading Chain & Block Corp., Dept. D-10, Reading, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave. Montour Falls, N. Y.

CRANES (Gasoline and Diesel)

Cullen-Friestedt Co., 1308 S. Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, O.
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

CRANES (Hand)

American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Chicago Tramrail Co., 2910 W. Carroll Ave., Chicago, Ill.
Cleveland Crane & Engineering Co., The, 1125 E. 283rd St., Wickliffe, O.
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Curtis Pneumatic Machinery Div. of Curtis Mfg. Co., 1996 Kienlen Ave., St. Louis, Mo.

CRANES (Hand)—Con.

Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, O.
Industrial Brownhoist Corp., Bay City, Mich.
Manning, Maxwell & Moore, Inc., Shaw-Box Crane & Hoist Div., 406 Broadway, Muskegon, Mich.
Reading Chain & Block Corp., Dept. D-10, Reading, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.

CRANES (Jib)

Alliance Machine Co., The, Alliance, O.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Chicago Tramrail Co., 2910 W. Carroll Ave., Chicago, Ill.
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Manning, Maxwell & Moore, Inc., Shaw Box Crane & Hoist Div., Muskegon, Mich.
Morgan Engineering Co., The Alliance, O.
Reading Chain & Block Corp., Dept. D-10, Reading, Pa.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.

CRANES (Locomotive)

Cullen-Friestedt Co., 1308 S. Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago. Ill.
Ohio Locomotive Crane Co., Bucyrus, O.
Osgood Co., The, Marion, O.
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

CRANES (Monorail)

American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Chicago Tramrail Co., 2910 W. Carroll Ave., Chicago, Ill.
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, O.
Manning, Maxwell & Moore, Inc., Shaw Box Crane & Hoist Div., Muskegon, Mich.
Reading Chain & Block Corp., Dept. D-10, Reading, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

CRANES (Portable Industrial, Electric)

Baker-Raulang Co., The, 2168 W. 25th St., Cleveland, O.

CRANES (Traveling)

Chicago Tramrail Co., 2910 W. Carroll Ave., Chicago, Ill.
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, O.
Manning, Maxwell & Moore, Inc., Shaw Box Crane & Hoist Div., Muskegon, Mich.
Reading Chain & Block Corp., Dept. D-10. Reading, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.

CRANK SHAFTS

Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Erie Forge Co., W. 15th & Cascade Sts., Erie, Pa.
Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago, Ill.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Union Drawn Steel Div. Republic Steel Corp., Massillon, O.

CRAYONS (Metal Marking)

American Crayon Co., Sandusky, O.
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.

CRUSHERS

American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.
Diamond Iron Works, Inc., Minneapolis, Minn.
Gruendler Crusher & Pulverizer Co., 2920-28 N. Market St., St. Louis, Mo.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

CUSHIONS (Pneumatic)

Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

CUTTERS (Die Sinking & End Milling)

Brown & Sharpe Mfg. Co., Providence, R. I.
Detroit Tap & Tool Co., 8432 Butler St., Detroit, Mich.
Tomkins-Johnson Co., The, Dept. S, 611 N. Mechanic St., Jackson, Mich.

CUTTER (Gang Slitter)

Cowles Tool Co., 2086 W. 110 St., Cleveland, O.

CUTTING AND WELDING—See WELDING

CUTTING OILS—See OILS (Cutting)

CUTTING-OFF MACHINES (Abrasive)

Campbell, Andrew C., Div., American Chain & Cable Co., Inc., Bridgeport, Conn.
DeSanno, A. P., & Son Inc., 436 Wheatland St., Phoenixville, Pa.

CUTTING-OFF MACHINES (Rotary)

Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.
Taylor-Wilson Mfg. Co., 1200 Thomson Ave., McKees Rocks, Pa.
Yoder Co., The, W. 55th & Walworth Ave., Cleveland, O.

CYANIDING

Lakeside Steel Improvement Co., The, 5418 Lakeside Ave., Cleveland, O.

CYLINDERS (Air or Hydraulic)

American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.
Anker-Holth Mfg. Co.—Airgrip Chuck Div., 332 S. Michigan Ave., Chicago, Ill.
Curtis Pneumatic Machinery Div. of Curtis Mfg. Co., 1996 Kienlen Ave., St. Louis, Mo.
Galland-Henning Mfg. Co., 2747 S. 31st St., Milwaukee, Wis.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Scaife Co., Ann St., Oakmont, Pa.
Tomkins-Johnson Co., The, Dept. S, 611 N. Mechanic St., Jackson, Mich.

CYLINDERS (Pressure)

Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co., 1461 S. 66th St., Milwaukee, Wis.
Scaife Co., Ann St., Oakmont, Pa.

DEGREASERS

Detroit Rex Products Co., 13029 Hillview Ave., Detroit, Mich.
Magnus Chemical Co., Inc., 206 South Ave., Garwood, N. J.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.

DEOXIDIZERS

Vanadium Corp. of America, 420 Lexington Ave., New York City.

DESCALING PROCESSES

American Foundry Equipment Co., The, Mishawaka, Ind.
Bullard Co., The, Bridgeport, Conn.
Turco Products, Inc., 6135 S. Central Ave., Los Angeles, Calif.

DIAMONDS (Wheel Dressing)

Diamond Tool Co., 933 E. 41st St., Chicago, Ill.

DIE BLOCKS

American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Ampco Metal, Inc., Dept. S-10, 3830 W. Burnham St., Milwaukee, Wis.
Bissett Steel Co., The, 945 E. 67th St., Cleveland, O.
Firth-Sterling Steel Company, McKeesport, Pa.
Heppenstall Co., Box S-9, 4620 Hatfield St., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago, Ill.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.

DIE CENTERS

Firth-Sterling Steel Company, McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

DIE CUSHIONS

Dayton-Rogers Mfg. Co., Dept. C., 2830 13th Ave. So., Minneapolis, Minn.

DIE HANDLING EQUIPMENT (Lifters)

Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.

DIE HEADS

Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., The, 170 E. 131st St., Cleveland, O.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

DIE-SINKING MACHINES

Cincinnati Milling Machine Co., Cincinnati, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.,

DIES (Punching, Stamping, Blanking)

Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Spriesch Tool & Mfg. Co., 10 Howard St., Buffalo, N. Y.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

DIES (Steel, Embossing)

Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.

DIFFERENTIALS

Fairfield Manufacturing Co., 303 S. Earl Ave., Lafayette, Ind.

DISCS (Abrasive)

Chicago Wheel & Manufacturing Co., 1101 W. Monroe St., Chicago, Ill.

DOLOMITE—FLUX AND REFRACTORIES

Basic Refractories, Inc., Hanna Bldg., Cleveland, O.

DOORS & SHUTTERS (Steel, Fire and Rolling)

Kinnear Mfg. Co., 1780-1800 Fields Ave., Columbus, O.

DRAFT GAGES (Indicating, Recording)

Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.
Peabody Engineering Corp., 580 Fifth Ave., New York City.

DRAGLINES (Crawler)

Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

DRAW BENCHES

Aetna-Standard Engineering Co., The, Home Savings Bank Bldg., Youngstowa, O.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRESSERS (Grinding Wheel)

Chicago Wheel & Manufacturing Co., 1101 W. Monroe St., Chicago, Ill.
Diamond Tool Co., 933 E. 41st St., Chicago, Ill.

DRILL HEADS

Michigan Industrial Sales Co., 132 Duffield St., Detroit, Mich.

DRILL HEADS (Multiple)

Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

DRILL RODS—See RODS (Drill)

DRILLING MACHINERY

Walker-Turner Co., Inc., 50102 Berckman St., Plainfield, N. J.

DRILLS (Electric Portable)

Chicago Wheel & Manufacturing Co., 1101 W. Monroe St., Chicago, Ill.

DRILLING MACHINES (Radial)

Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Walker-Turner Co., Inc., 50102 Berckman St., Plainfield, N. J.

DRILLING MACHINES (Vertical)

Bryant Machinery & Engineering Co., 400 W. Madison St., Chicago, Ill.
Cleereman Machine Tool Co., Green Bay, Wis.
Walker Turner Co., Inc.,
Walker-Turner Co., Inc., 50102 Berckman St., Plainfield, N. J.

DRILLS (Twist)—See TWIST DRILLS

DRIVES (Chain)

Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.

DRIVES (Cut Herringbone Gear)

Foote Bros. Gear & Machine Co., 5301 S. Western Blvd., Chicago, Ill.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Philadelphia Gear Works, Erie Ave. & G Sts., Philadelphia, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

DRIVES (Multi-V-Belt)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Worthington Pump & Machinery Corp., Harrison, N. J.

DRUMS (Steel)

Pressed Steel Tank Co., 1461 So. 66th St., Milwaukee, Wis.

DRY CLEANING EQUIPMENT

Detroit Rex Products Co., 13029 Hillview Ave., Detroit, Mich.

DRYERS (Compressed Air)

Ruemelin Mfg. Co., 3882 N. Palmer St., Milwaukee, Wis.

DRYERS (Paint, Varnish, Enamel, Chemical)

Maehler, Paul, Co., The, 2208 W. Lake St., Chicago, Ill.

DRYERS (Rotary)

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Salem Engineering Co., 714 S. Broadway, Salem, O.

DUCTS (Acid Fume, Rubber Lined)

American Hard Rubber Co., 11 Mercer St., New York City.

DUST ARRESTING EQUIPMENT

American Air Filter Co., 443 Central Ave., Louisville, Ky.
American Foundry Equipment Co., The, 509 So. Byrkit St., Mishawaka, Ind.
Bartlett, C. O., & Snow Co., 6200 Harvard Ave., Cleveland, O.
Pangborn Corp., Hagerstown, Md.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Ruemelin Mfg. Co., 3882 N. Palmer St., Milwaukee, Wis.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Vapor Blast Mfg. Co.,

ECONOMIZERS

Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Salem Engineering Co., 714 S. Broadway, Salem, O.
933 S. 10th St., Milwaukee, Wis.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

ELECTRIC WELDING—See WELDING

ELECTRIC WIRING—See WIRE AND CABLE (Electric)

ELECTRICAL EQUIPMENT

Allen-Bradley Co., 1320 S. Second St., Milwaukee, Wis.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., 420 Lexington Ave., New York City.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

ELECTRODES (Carbon and Graphite)

National Carbon Co., W. 117th St & Madison Ave., Cleveland, O.

ELECTRODES (Hard Surfacing Welding)

General Electric Co., Schenectady, N. Y.
Page Steel & Wire Div., American Chain & Cable Co., Inc., Monessen, Pa.

ELECTRODES (Resistance Welding)

Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.

ELEVATING AND CONVEYING MACHINERY—See CONVEYORS

ENGINEERS AND CONTRACTORS

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Hydropress, Inc., 370 Lexington Ave., New York City.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Pollock, Wm. B. Co., The, 101 Andrews Ave., Youngstown, O.
Pritchard, J. F. & Co., Dwight Bldg., Kansas City, Mo.
Wean Engineering Co., Warren, O.

ENGINEERS (Consulting)

Aetna-Standard Engineering Co., The Home Savings Bank Bldg., Youngstown, O.
Easton Car & Construction Co., Easton, Pa.
Freyn Engineering Co., 310 S. Michigan Ave., Chicago, Ill.
Garrett, George K., Co., D & Tioga Sts., Philadelphia, Pa.
Hepburn American Co., Maher Bldg., Greenwich, Conn.
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Wean Engineering Co., Warren, O.

ENGINES (Diesel)

Cooper-Bessemer Corp., The, Mt. Vernon, O.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES (Gas, Oil)

Cooper-Bessemer Corp., The, Mt. Vernon, O.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES (Kerosene)

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.

ENGINES (Steam)

Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

EXCAVATORS

Osgood Co., The, Marion, O.
Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

FANS (Crane Cab)

Graybar Electric Co., 420 Lexington Ave., New York City.
Perkins, B. F., & Son, Inc., Holyoke, Mass.

FANS (Exhaust Ventilating)

Graybar Electric Co., 420 Lexington Ave., New York City.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

FANS (Portable)

Graybar Electric Co., 420 Lexington Ave., New York City.
Perkins, B. F., & Son, Inc., Holyoke, Mass.

FANS (Wall)

Graybar Electric Co., 420 Lexington Ave., New York City.
Perkins, B. F., & Son, Inc., Holyoke, Mass.

FENCE (Chain Link)

Continental Steel Corp., Kokomo, Ind.
Cyclone Fence Div., American Steel & Wire Co., Waukegan, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.

FENCING (Wire)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., E. 45th & Broadway, Cleveland, Ohio.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

FERROALLOY (Briquets)

Electro Metallurgical Co., 30 E. 42nd St., New York City.

FERROALLOYS

Cleveland-Cliffs Iron Co., The, Union Commerce Bldg., Cleveland, O.
Electro Metallurgical Co., 30 E. 42nd St., New York City.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Metal & Thermit Corp., 120 Broadway, New York City.
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROCHROME

Electro Metallurgical Co., 30 E. 42nd St., New York City.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROMANGANESE

Bethlehem Steel Co., Bethlehem, Pa.
Electro Metallurgical Co., 30 E. 42nd St., New York City.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROPHOSPHORUS

Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROSILICON

Electro Metallurgical Co., 30 E. 42nd St., New York City.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Southern Ferro Alloys Co., 2108 Chestnut St., Chattanooga, Tenn.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROSILICON ALUMINUM

Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROTITANIUM

Metal & Thermit Corp., 120 Broadway, New York City.
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROVANADIUM

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FILES AND RASPS

Atkins, E. C., & Co., 427 S. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILTER CLOTH (Asbestos)

Johns-Manville Corp., 22 E. 40th St., New York City.

FIRE BRICK—See BRICK

FIRE BRICK (Insulating)

Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.

FIRE CLAY—See REFRACTORIES

FIRE DOORS & SHUTTERS—See DOORS & SHUTTERS

FIRE EXTINGUISHERS

Cardox Corp., 307 N. Michigan Ave., Chicago, Ill.
Kidde, Walter, & Co., Inc., 932 West St., Bloomfield, N. J.

FIRE EXTINGUISHING SYSTEMS

Cardox Corp., 307 N. Michigan Ave., Chicago, Ill.
Kidde, Walter, & Co., Inc., 932 West St., Bloomfield, N. J.

FIRE PROTECTION EQUIPMENT

Cardox Corp., 307 N. Michigan Ave., Chicago, Ill.
Walter Kidde & Co., Inc., 932 West St., Bloomfield, N. J.

FITTINGS (Malleable and Cast Iron)

Flori Pipe Co., The, 5700 Bulwer Ave., St. Louis, Mo.

FITTINGS (Rubber Lined)

American Hard Rubber Co., 11 Mercer St., New York City.

FIXTURES (Fluorescent Lighting)

Guth, Edwin F., Co., The, 2615 Washington Ave., St. Louis, Mo.

FLAME HARDENING

Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., 30 E. 42nd St., New York City.
National-Erie Corp., Erie, Pa.

FLANGES (Forged Steel)

Kropp Forge Co., 3301 W. Roosevelt Rd., Chicago, Ill.

FLANGES (Welded Steel)

King Fifth Wheel Co., 2915 N. Second St., Philadelphia, Pa.

FLOORING (Monolithic)

Carey, Philip, Mfg. Co., The, Lockland, Cincinnati, O.
Johns-Manville Corp., 22 E. 40th St., New York City.

FLOORING (Steel)

Alan Wood Steel Co., Conshohocken, Pa.
Blaw-Knox Co., Blawnox, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Robertson, H. H., Co., Farmers Bank Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

FLUE DUST CONDITIONERS

Brosius, Edgar E., Co., Sharpsburg, Branch, Pittsburgh, Pa.

FLUE GAS ANALYZERS

Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

FLUORSPAR

Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FLUXES (Soldering, Welding & Tinning)

American Chemical Paint Co., Dept. 310, Ambler, Pa.
Kester Solder Co., 4222 Wrightwood Ave., Chicago, Ill.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

FORGING BILLETS—See BILLETS (Forging)

FORGING DIES

Kropp Forge Co., 5301 W. Roosevelt, Rd., Chicago, Ill.

FORGING MACHINERY

Alliance Machine Co., The, Alliance, O.
Erie Foundry Co., Erie, Pa.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
National Machinery Co., The, Tiffin, O.

FORGINGS (Aluminum, Brass, Bronze, Copper)

American Brass Co., The, Waterbury, Conn.
Ampco Metal Inc., Dept. S-10, 3830 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

FORGINGS (Drop) (*Also Stainless)

*Atlas Drop Forge Co., Lansing, Mich.
*Bethlehem Steel Co., Bethlehem, Pa.
Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago, Ill.
Oil Well Supply Co., Dallas, Texas.
Phoenix Manufacturing Co., Joliet, Ill.

FORGINGS (Hollow Bored)

American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Erie Forge Co., W. 15th & Cascade Sts., Erie, Pa.
Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago, Ill.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Phoenix Manufacturing Co., Joliet, Ill.

FORGINGS (Iron and Steel) (*Also Stainless)

*Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Erie Forge Co., W. 15th & Cascade Sts., Erie, Pa.
Heppenstall Co., Box S-9, 4620 Hatfield St., Pittsburgh, Pa.
*Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago, Ill.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
Oil Well Supply Co., Dallas, Texas.
Phoenix Manufacturing Co., Joliet, Ill.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

FORGINGS (Machined)

Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago, Ill.

FORGINGS (Small)

Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago, Ill.
Phoenix Manufacturing Co., Joliet, Ill.

FORGINGS (Upset)

Atlas Drop Forge Co., Lansing, Mich.
Bethlehem Steel Co., Bethlehem, Pa.
Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago, Ill.
Phoenix Manufacturing Co., Joliet, Ill.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.

FOUNDRY EQUIPMENT

American Foundry Equipment Co., The, 509 S. Byrkit St., Mishawaka, Ind.
Mahr Mfg. Co., Minneapolis, Minn.
Pangborn Corporation, Hagerstown, Md.
Ransohoff, N., Inc., Elmwood Place, Cincinnati, O.
Vapor Blast Mfg. Co., 333 S. 16th St., Milwaukee, Wis.

FROGS AND SWITCHES

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.

FURNACE INSULATION—See INSULATION

FURNACES (Blast)

Freyn Engineering Co., 310 S. Michigan Ave., Chicago, Ill.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

FURNACES (Brazing)

Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., The, Salem, O.
Firth-Sterling Steel Co., McKeesport, Pa.
General Electric Co., Schenectady, N. Y.
Hevi Duty Electric Co., 4212 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Electric Heating)

Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4212 W. Highland Blvd., Milwaukee, Wis.
Mahr Mfg. Co., Minneapolis Minn.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1257, Pittsburgh, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, E. Pittsburgh, Pa.

FURNACES (Electric Melting)

Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Detroit Electric Furnace Div., Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1257, Pittsburgh, Pa.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.

FURNACES (Enameling)

Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, George J., Co., 2400 E. Carson St., Pittsburgh, Pa.

FURNACES (Forging)

Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Bellis Heat Treating Co., Branford, Conn.
Drever Co., The, 730 E. Venango St., Philadelphia, Pa.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Mahr Mfg. Co., Minneapolis, Minn.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
R-S Products Corp., 123 Berkley St., Philadelphia, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Div. of General Properties Co., Inc., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.

FURNACES (Galvanizing)

Mahr Mfg. Co., Minneapolis, Minn.
Salem Engineering Co., 714 So. Broadway, Salem, O.

FURNACES (Gas or Oil)

Drever Co., The, 730 E. Venango St., Philadelphia, Pa.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Harvey Furnace Co., The, 2935 St. Paul St., Baltimore, Md.
Mahr Mfg. Co., Minneapolis, Minn.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
R-S Products Corp., 123 Berkeley St., Philadelphia, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Div. of General Properties Co., Inc., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.

FURNACES (Heat Treating, Annealing, Carburizing, Hardening, Tempering)

Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Bellis Heat Treating Co., Branford, Conn.
Carborundum Co., The, Perth Amboy, N. J.
Despatch Oven Co., 722 Central Ave., Minneapolis, Minn.
Drever Co., The, 730 E. Venango St., Philadelphia, Pa.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4212 W. Highland Blvd., Milwaukee, Wis.
Holden, A. F., Co., The, 200 Winchester Ave., New Haven, Conn.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.
Mahr Mfg. Co., Minneapolis, Minn.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
R-S Products Corp., 132 Berkley St., Philadelphia, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Div. of General Properties Co., Inc., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

FURNACES (Laboratory)

Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Dietert, Harry W., Co., 9330J Roselawn Ave., Detroit, Mich.
Hevi Duty Electric Co., 4212 W. Highland Blvd., Milwaukee, Wis.
Mahr Mfg. Co., Minneapolis, Minn.

FURNACES (Non-Ferrous Melting)

Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Detroit Electric Furnace Div., Kuhlman Electric Co., Bay City, Mich.

FURNACES (Open Hearth)

Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2300 Chester Ave., Cleveland, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.

FURNACES (Portable)

Hagan, George J., Co., 2400 E. Carson St., Pittsburgh, Pa.

FURNACES (Recuperative)

Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Div. of General Properties Co., Inc., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.

FURNACES (Rivet Heating)

Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Mahr Mfg. Co., Minneapolis, Minn.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Div. of General Properties Co., Inc., 2375 Dorr St., Toledo, O.

FURNACES (Sheet and Tin Mill)

Aetna-Standard Engineering Co., The, Home Savings Bank Bldg., Youngstown, O.
Electric Furnace Co., Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Div. of General Properties Co., Inc., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 20005 Lake Rd., Cleveland, O.

FURNACES (Steel Mill)

Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Electric Furnace Co., Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Div. of General Properties Co., Inc., 2375 Dorr St., Toledo, O.
Swindell-Dressler Corp., P. O. Box 1888, Pittsburgh, Pa.
Wellman Engineering Co., The, 7016 Central Ave., Cleveland, O.
Wilson, Lee, Engineering Co., 20005 Lake Rd., Cleveland, O.

FURNACES (Welding)

Hagan, George J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Mahr Mfg. Co., Minneapolis, Minn.

GAGES

Agerstrand Corp., Muskegon, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Firth-Sterling Steel Co., McKeesport, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.
Sheffield Corp., The, Gage Div., Dayton, O.
Trico Products Corp., 97 Burton St., Buffalo, N. Y.

GAGES (Automatic Control & Recording)

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Hays Corp., The, Michigan City, Ind.

GAGES (Indicating and Recording)

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
General Electric Co., Schenectady, N. Y.
Hays Corp., The, Michigan City, Ind.
Sheffield Corp., The, Gage Div., Dayton, O.

GAGES (Pressure & Vacuum Recording)

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Hays Corp., The, Michigan City, Ind.

GAGES (Thread-Ring & Plug)

Detroit Tap & Tool Co., 8432 Butler St., Detroit, Mich.

GALVANIZING (Hot Dip)

Atlantic Stamping Co., Rochester, N. Y.
Equipment Steel Products Div., Blue Island, Ill.

GALVANIZING (Hot Dip)

Acme Galvanizing, Inc., Milwaukee, Wis.
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
American Hot Dip Galvanizers Assoc., Inc., American Bank Bldg., Pittsburgh, Pa.
American Tinning & Galvanizing Co., Erie, Pa.
Atlantic Steel Co., Atlanta, Ga.
Buffalo Galvanizing & Tinning Works, Inc., Buffalo, N. Y.
Cattie, Jos. F., & Bros., Gaul and Liberty Sts., Philadelphia, Pa.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Fanner Mfg. Co., The, Cleveland, O.
Finn, John, Metal Works, San Francisco, Calif.
Galvanizers Incorporated, Portland, Ore.
Gregory, Thomas, Galvanizing Works, Maspeth, N. Y.
Hanlon-Gregory Galvanizing Co., 5515 Butler St., Pittsburgh, Pa.
Hill, James, Mfg. Co., Providence, R. I.
Hubbard & Co., Oakland, Calif.
Independent Galvanizing Co., Newark, N. J.
International-Stacey Corp., Columbus, O.
Isaacson Iron Works, Seattle, Wash.
Joslyn Co. of California, Los Angeles, Calif.
Joslyn Mfg. & Supply Co., Chicago, Ill.
Koven, L. O., & Bro., Inc., Jersey City, N. J.
Lehigh Structural Steel Co., Allentown, Pa.
Lewis Bolt & Nut Co., Minneapolis, Minn.
Missouri Rolling Mill Corp., St. Louis, Mo.
National Telephone Supply Co., The, Cleveland, O.
Riverside Foundry & Galvanizing Co., Kalamazoo, Mich.
San Francisco Galvanizing Works, San Francisco, Calif.
Sanitary Tinning Co., The, Cleveland, O.
Scaife Co., Ann St., Oakmont, Pa.
Standard Galvanizing Co., Chicago, Ill.
Wilcox, Crittenden & Co., Inc., Middletown, Conn.
Witt Cornice Co., The, Cincinnati, O.

GALVANIZING PLANTS FOR SHEETS

Aetna-Standard Engineering Co., The, Home Savings Bank Bldg., Youngstown, O.
Erie Foundry Co., Erie, Pa.
Wean Engineering Co., Warren, O.

GALVANIZING PRODUCTS

Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.

GAS HOLDERS

Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

GAS PRODUCER PLANTS

Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

GAS RECOVERY COKE OVENS AND GAS PLANTS

Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

GAS SCRUBBERS

Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

GASKETS (Asbestos, Metal or Rubber)

Johns-Manville Corp., 22 E. 40th St., New York City.

GEAR BLANKS

Ampco Metal, Inc., Dept. S-10, 3830 W. Burnham St., Milwaukee, Wis.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Foote Bros. Gear & Machine Co., 5301 S. Western Blvd., Chicago, Ill.
King Fifth Wheel Co., 2915 No. Second St., Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Waldron, John, Corp., New Brunswick, N. J.

GEAR MACHINERY (Generating)

National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.

GEAR MACHINERY (Lapping, Finishing, Checking)

Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

GEARS (Non-Metallic)

Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Pittsburgh Gear & Machine Co., 2680-2700 Smallman St., Pittsburgh, Pa.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.

GEARS (Steel Laminated)

Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.
Waldron, John, Corp., New Brunswick, N. J.

GEARS (Worm)

Cleveland Worm & Gear Co., 3270 E. 80th St., Cleveland, O.
Fairfield Manufacturing Co., 303 S. Earl Ave., Lafayette, Ind.
Foote Bros. Gear & Machine Co., 5301 S. Western Blvd., Chicago, Ill.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Link-Belt Co., 2045 Hunting Park Ave., Indianapolis, Ind.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Philadelphia Gear Works, Erie Ave. & G Sts., Philadelphia, Pa.
Pittsburgh Gear & Machine Co., 2680-2700 Smallman St., Pittsburgh, Pa.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.

GEARS AND GEAR CUTTING

Borsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Fairfield Manufacturing Co., 303 S. Earl Ave.,
Foote, Bond, Gear Works, Cicero, Ill.
Foote Bros. Gear & Machine Co., 5301 S. Western Blvd., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Grant Gear Works, 2nd & B Sts., Boston, Mass.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Jones, W. A., Fdry. & Mach. Co., 4437 Roosevelt Rd., Chicago, Ill.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa. Lafayette, Ind.
Mackintosh-Hemphill Co., 19th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
National-Erie Corp., Erie, Pa.
Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa.
Pittsburgh Gear & Machine Co., 2680-2700 Smallman St., Pittsburgh, Pa.
Simonds Gear & Mfg. Co., 25th St., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

GENERATING SETS

Century Electric Co., 1806 Pine St., St. Louis, Mo.
Cooper-Bessemer Corp., The, Mt. Vernon, O.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Reliance Electric & Eng. Co., 1088 Ivanhoe Rd., Cleveland, O.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

GENERATORS (Acetylene—Portable and Stationary)

Linde Air Products Co., The, 30 E. 42nd St., New York City.

GENERATORS (Electric)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Century Electric Co., 1806 Pine St., St. Louis, Mo.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O.
Reliance Electric & Eng. Co., 1088 Ivanhoe Rd., Cleveland, O.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

GENERATORS (Plating)

Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

GRABS—FOR SHEETS, COILS, INGOTS

J-B Engineering Sales Co., 3100 East St., New Haven, Conn.

GRAPHITE

National Carbon Co., W. 117th St. & Madison Ave., Cleveland, O.
United States Graphite Co., The, Saginaw, Mich.

GRATING

Blaw-Knox Co., Blawnox, Pa.
Dravo Corp., (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

GREASE (Lubricating)—See LUBRICANTS (Industrial)

GREASE SEALS

Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

GRINDER ATTACHMENTS

Fitchburg Grinding Machine Corp., Fitchburg, Mass.

GRINDER CENTERS

Firth-Sterling Steel Company, McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

GRINDER HEADS

Fitchburg Grinding Machine Corp., Fitchburg, Mass.

GRINDERS

Heald Machine Co., Worcester, Mass.

GRINDERS (Bench & Floor Type)

Walker-Turner Co., Inc., 50102 Berckman St., Plainfield, N. J.

GRINDERS (Centerless, Internal and External)

Cincinnati Grinders, Inc., Cincinnati, O.
Heald Machine Co., Worcester, Mass.

GRINDERS (Chucking)

Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Heald Machine Co., Worcester, Mass.

GRINDERS (Circular Saw)

Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.

GRINDERS (Crank Pin, Cam, Piston, Valve Face)

Cincinnati Grinders, Inc., Cincinnati, O.
Norton Company, Worcester, Mass.

GRINDERS (Cylindrical)

Norton Co., Worcester, Mass.

GRINDERS (Die)

Fitchburg Grinding Machine Corp., Fitchburg, Mass.

GRINDERS (Foundry Core)

Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

GRINDERS (Oscillating)
Van Norman Machine Tool Co., Springfield, Mass.

GRINDERS (Plain and Universal)
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, O.
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Norton Co., Worcester, Mass.

GRINDERS (Precision Thread)
Ex-Cell-O Corp., 1223 Oakman Blvd., Detroit, Mich.
Jones & Lamson Machine Co., Springfield, Vt.

GRINDERS (Roll)
Mesta Machine Co., P. O. Box 1466 Pittsburgh, Pa.
Norton Co., Worcester, Mass.

GRINDERS (Rotary Surface)
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Heald Machine Co., Worcester, Mass.

GRINDERS (Sheet Steel & Internal Tube)
Mattison Machine Works, Rockford, Ill.

GRINDERS (Single Slide Internal)
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDERS (Spline)
Fitchburg Grinding Machine Corp., Fitchburg, Mass.

GRINDERS (Surface)
Brown & Sharpe Mfg. Co., Providence, R. I.
Heald Machine Co., Worcester, Mass.
Mattison Machine Works, Rockford, Ill.
Norton Company, Worcester, Mass.

GRINDERS (Tool and Cutter)
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, O.
Ex-Cell-O Corp., 1223 Oakman Blvd., Detroit, Mich.
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago, Ill.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
Norton Co., Worcester, Mass.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.
Sellers, William, & Co., Inc., 16th & Callowhill Sts., Philadelphia, Pa.

GRINDING (Shear Knife)
American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.

GRINDING COMPOUNDS
Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul, Minn.
Stuart, D. A., Oil Co., Ltd., 2733 S. Troy St., Chicago, Ill.
Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.

GRINDING MACHINES (Gear)
Fitchburg Grinding Machine Corp., Fitchburg, Mass.

GRINDING MACHINES—See GRINDERS

GRINDING WHEELS
Abrasive Co., Tacony & Fraley Sts., Philadelphia, Pa.
Atkins, E. C., & Co., 427 S. Illinois St., Indianapolis, Ind.
Bay State Abrasive Products Co., Westboro, Mass.
Blanchard Machine, Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
DeSanno, A. P., & Son Inc., 436 Wheatland St., Phoenixville, Pa.
Macklin Co., Jackson, Mich.
Norton Co., Worcester, Mass.
Sterling Grinding Wheel Div., Cleveland Quarries Co., Tiffin, O.

GRINDING WHEELS (Segmental)
Abrasive Co., Tacony & Fraley Sts., Philadelphia, Pa.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Macklin Co., Jackson, Mich.
Norton Company, Worcester, Mass.
Sterling Grinding Wheel Div., Cleveland Quarries Co., Tiffin, O.

GUIDE SHOES
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUIDES (Mill)
Ampco Metal, Inc., Dept. S-8, 3830 W. Burnham St., Milwaukee, Wis.
National-Erie Corp., Erie, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUNS (Blast Furnace Mud)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

GUNS (Steam, Hydraulic, Electric)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

HAMMER BOARDS
Irwin, H. G., Lumber Co., Garland, Pa.

HAMMERS (Drop)
Alliance Machine Co., The, Alliance, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Standard Machinery Co., Providence, R. I.

HAMMERS (Power)
Yoder Co., The, W. 55th St. & Walworth Ave., Cleveland, O.

HAMMERS (Steam)
Alliance Machine Co., The, Alliance, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HANGERS
Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HANGERS (Shaft)
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Corp., Harrison, N. J.
Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.
New Departure Div., General Motors Corp., Bristol, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HEADING MACHINERY
Hydraulic Press Mfg. Co., Mt. Gilead, O.
National Machinery Co., Tiffin, O.

HEAT TREATING
Agerstrand Corp., Muskegon, Mich.
Lakeside Steel Improvement Co., The, 5418 Lakeside Ave., Cleveland, O.

HEAT TREATING MATERIALS
Houghton, E. F., & Co., Third, American & Somerset Sts., Philadelphia, Pa.
Park Chemical Co., 8076 Military Ave., Detroit, Mich.

HEATERS (Air)
Salem Engineering Co., 714 S. Broadway, Salem, O.

HEATERS (Electric Rolls)
Freyn Engineering Co., 310 S. Michigan Ave., Chicago, Ill.

HEATERS (Electric Space)
American Foundry Equipment Co., The, Mishawaka, Ind.
Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

HEATERS (Unit)
Dravo Corp., (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Grinnell Co., Inc., Providence, R. I.
Salem Engineering Co., 714 S. Broadway, Salem, O.

HELMETS (Blast Cleaning)
American Foundry Equipment Co., The, Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

HITCHINGS (Mine Car)
American Chain & Cable Co., Inc., Bridgeport, Conn.

HOBS
Brown & Sharpe Mfg. Co., Providence, R. I.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

HOISTS (Chain)
Chicago Tramrail Co., 2910 W. Carroll Ave., Chicago, Ill.
Cleveland Tramrail Div., of The Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Ford Chain Block Div. of American Chain & Cable Co. Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Reading Chain & Block Corp., Dept. D-10 Reading, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.

HOISTS (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Chicago Tramrail Co., 2910 W. Carroll Ave., Chicago, Ill.
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Manning, Maxwell & Moore, Inc., Shaw-Box Crane & Hoist Div., 406 Broadway, Muskegon, Mich.
Reading Chain & Block Corp., Dept. D-10, Reading, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.

HOISTS (Hand)
Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.

HOISTS (Monorail)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Chicago Tramrail Co., 2910 W. Carroll Ave., Chicago, Ill.
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Euclid Crane & Hoist Co., The, Chardon Rd., Euclid, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Manning, Maxwell & Moore, Inc., Shaw-Box Crane & Hoist Div., 406 Broadway, Muskegon, Mich.
Reading Chain & Block Corp., Dept. D-10, Reading, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

HOISTS (Pneumatic)
Curtis Pneumatic Machinery Div. of Curtis Mfg. Co., 1906 Kienlen Ave., St. Louis, Mo.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.

HONING MACHINES
Micromatic Hone Corp., 1345 E. Milwaukee Ave., Detroit, Mich.

HOOKS (Chain)
American Chain Div. American Chain & Cable Co., Inc., York, Pa.

HOOPS (Welded Wire)
Keystone Steel & Wire Co., Dept. AC, Peoria, Ill.

HOOPS AND BANDS
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn.
Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

HOSE (Flexible Metal)
American Metal Hose Branch of The American Brass Co., Waterbury, Conn.
Chicago Metal Hose Corp., 1315 S. Third St., Maywood, Ill.
Weatherhead Co., The, 300 E. 131st St., Cleveland, O.

HOSE REINFORCEMENT MACHINES
Fidelty Machine Co., 3908-18 Frankford Ave., Philadelphia, Pa.

HOSE (Rubber)
United States Rubber Co., 1230 Sixth Ave., New York City.

HUMIDIFIERS (Industrial)
Grinnell Co., Inc., Providence, R. I.

HYDRAULIC MACHINERY

Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Elmes, Chas. F., Engineering Works, 245 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Hydropress, Inc., 570 Lexington Ave., New York City.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Weinman Pump & Supply Co., The, 210 Boulevard of the Allies, Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

HYDRAULIC PRESSES—See PRESSES (Hydraulic)

HYDRAULIC UNITS

Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Racine Tool & Machine Co., Racine, Wis.
Weinman Pump & Supply Co., The, 210 Boulevard of the Allies, Pittsburgh, Pa.

INDICATORS (Blast Furnace Stock Line)

Brostius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

INDICATORS (Temperature)

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hays Corp., The, Michigan City, Ind.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

INDUCTION BRAZING and SOLDERING EQUIPMENT

Lepel High Frequency Laboratories, Inc., 39 W. 60 St., New York City.
Ohio Crankshaft Co., The, 6600 Clement Ave., Cleveland, O.

INDUCTION HEATING and HARDENING EQUIPMENT

Lepel High Frequency Laboratories, Inc., 39 W. 60 St., New York City.
Ohio Crankshaft Co., The, 6600 Clement Ave., Cleveland, O.

INGOT MOLD WASH (Graphite)

National Carbon Co., W. 117th St. & Madison Ave., Cleveland, O.
United States Graphite Co., The, Saginaw, Mich.

INGOT MOLDS

Bethlehem Steel Co., Bethlehem, Pa.
Shenango-Penn Mold Co., Oliver Bldg., Pittsburgh, Pa.
Valley Mould & Iron Corp., Hubbard, O.

INHIBITORS

American Chemical Paint Co., Dept. 310 Ambler, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.

INSPECTION EQUIPMENT

Trico Products Corp., 97 Burton St., Buffalo, N. Y.

INSPECTING TOOLS

Scherr, George, Co., 126 Lafayette St., New York City.
Trico Products Corp., 97 Burton St., Buffalo, N. Y.

INSTRUMENTS (Electric-Indicating and Recording)

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Brush Development Co., 3311 Perkins Ave., Cleveland, O.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., 420 Lexington Ave., New York City.
Westinghouse Electric & Mfg. Co., Dept. 7N, East Pittsburgh, Pa.

INSULATING BLOCK

Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.
Obermayer Co., 2557 W. 18th St., Chicago, Ill.
Ramtite Co., The, Div. of the S. Obermayer Co., 2557 W. 18th St., Chicago, Ill.

INSULATING BRICK

Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.
Ramtite Co., The, Div. of the S. Obermayer Co., 2557 W. 18th St., Chicago, Ill.

INSULATING CONCRETE

Atlas Lumnite Cement Co., Dept. S, Chrysler Bldg., New York City.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Harbison-Walker Refractories Co., Farmers Bank Bldg, Pittsburgh, Pa.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING POWDER AND CEMENT

Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Harbison-Walker Refractories Co., Farmers Bank Bldg, Pittsburgh, Pa.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.
Ramtite Co., The, Div. of the S. Obermayer Co., 2557 W. 18th St., Chicago, Ill.

INSULATION (Building)

Carey, Philip, Mfg. Co., The, Lockland, Cincinnati, O.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATION (Furnace, Boiler Settings, Ovens, Steam Pipe, Etc.)

Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Johns-Manville Corp., 22 E. 40th St., New York City.

IRON (Bar)

Ryerson, Jos. T., & Son Co., 16th & Rockwell Sts., Chicago, Ill.

IRON ORE

Alan Wood Steel Co., Conshohocken, Pa.
Cleveland-Cliffs Iron Co., The, Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The Youngstown, O.

JACKS (Mechanical, Hydraulic, Screw)

Buda Co., The, Harvey, Ill.

JIG BORERS

Bryant Machinery & Engineering Co., 400 W. Madison St., Chicago, Ill.
Cleereman Machine Tool Co., Green Bay, Wis.

JIGS AND FIXTURES

Agerstrand Corp., Muskegon, Mich.
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.

KETTLES (Galvanizing)

Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

KEYS (Machine or Woodruff)

Moltrup Steel Products Co., Beaver Falls, Pa.

KNIVES

American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Atkins, E. C., & Co., 427 S. Illinois St., Indianapolis, Ind.
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.
Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Ohio Knife Co., Dreman Ave. & B. & O. R.R., Cincinnati, O.

LABORATORY EQUIPMENT

Dietert, Harry W., Co., 9330J Roselawn Ave., Detroit, Mich.

LABORATORY WARE

Bay State Abrasive Products Co., Westboro, Mass.
Norton Company, Worcester, Mass.

LADLES

Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

LAPPING MACHINES

Cincinnati Grinders, Inc., Cincinnati, O.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.
Norton Company, Worcester, Mass.

LARRIES (Coal)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.

LATHE CENTERS

Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.
South Bend Lathe Works, Dept. 893, South Bend, Ind.

LATHE DOGS (Drop Forged)

Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.
South Bend Lathe Works, Dept. 893, South Bend, Ind.

LATHE TOOLS (Carbide Tipped)

McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

LATHES

Hepburn American Co., Maher Bldg., Greenwich, Conn.
Jones & Lamson Machine Co., Springfield, Vt.
LeBlond, R. K., Machine Tool Co. The, Dept. J-2 Cincinnati, O.
Monarch Machine Tool Co., Sidney, O.
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.
South Bend Lathe Works, Dept. 893, South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Automatic)

Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Co., The, Bridgeport, Conn.
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vt.
Monarch Machine Tool Co., Sidney, O.
Wickes Brothers, Saginaw, Mich.

LATHES (Buffing & Polishing)

Chicago Wheel & Mfg. Co., 1101 W. Monroe St. Chicago, Ill.
Walker-Turner Co., Inc., 50102 Berckman St., Plainfield, N. J.

LATHES (Chucking)

Bullard Co., The, Bridgeport, Conn.
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.
Hepburn American Co., Maher Bldg., Greenwich, Conn.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

LATHES (Crankshaft)

Wickes Brothers, Saginaw, Mich.

LATHES (Double End)

Wickes Brothers, Saginaw, Mich.

LATHES (Engine)

Monarch Machine Tool Co., Sidney, O.
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.
South Bend Lathe Works, Dept. 893, South Bend, Ind.
Wickes Brothers, Saginaw, Mich.

LATHES (Gun)

Wickes Brothers, Saginaw, Mich.

LATHES (Railroad Car & Driving Wheel)

Sellers, William, & Co., Inc., 16th & Callowhill Sts., Philadelphia, Pa.

LATHES (Roll Turning)

Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Turret)

Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Company, The, Bridgeport, Conn.
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.

LATHES (Turret)—Con.

Jones & Lamson Machine Co., Springfield, Vt.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.
South Bend Lathe Works, Dept. 893, South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Turret, Vertical)

Bullard Co., The, Bridgeport, Conn.

LATHE CENTERS

Firth-Sterling Steel Co., McKeesport, Pa.

LEAD (Tellurium)

National Lead Co., 111 Broadway, New York City.

LEVELING MACHINES

Aetna-Standard Engineering Co., The, Home Savings Bank Bldg., Youngstown, O.
Erie Foundry Co., Erie, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Hydropress, Inc., 570 Lexington Ave., New York City.
McKay Machine Co., Youngstown, O.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

LIFTERS (Hand & Electric)

Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.

LIFTERS (Machine Shop)

Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.

LIFT TRUCKS—See TRUCKS (Lift)

LIFTING MAGNETS—See MAGNETS (Lifting)

LIGHTING (Industrial)

Graybar Electric Co., 420 Lexington Ave., New York City.
Guth, Edwin F., Co., The, 2615 Washington Ave., St. Louis, Mo.

LIGHTING (Fluorescent Equipment)

Guth, Edwin F., Co., The, 2615 Washington Ave., St. Louis, Mo.

LINERS (Pump and Cylinder)

Shenango-Penn Mold Co., 401 W. Third St., Dover, O.

LOCOMOTIVE CRANES—See CRANES (Locomotive)

LOCOMOTIVES (Diesel-Electric)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Cooper-Bessemer Corp., The, Mt. Vernon, O.
Davenport-Besler Corp., Davenport, Iowa.
Plymouth Locomotive Works, Div., Fate-Root-Heath Co., Plymouth, O.
Porter, H. K., Co., Inc., 49th & Harrison Sts., Pittsburgh, Pa.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Diesel-Mechanical)

Davenport-Besler Corp., Davenport, Iowa.
Plymouth Locomotive Works, Div., Fate-Root-Heath Co., Plymouth, O.
Porter, H. K., Co., Inc., 49th & Harrison Sts., Pittsburgh, Pa.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Electric)

Davenport-Besler Corp., Davenport, Iowa.
Porter, H. K., Co., Inc., 49th & Harrison Sts., Pittsburgh, Pa.

LOCOMOTIVES (Electric Trolley)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Fireless)

Porter, H. K., Co. Inc., 49th & Harrison Sts., Pittsburgh, Pa.

LOCOMOTIVES (Gasoline-Electric)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Gasoline Mechanical)

Davenport-Besler Corp., Davenport, Iowa.
Whitcomb Locomotive Co., Rochelle, Ill.

LOCOMOTIVES (Oil-Electric)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.

LOCOMOTIVES (Steam)

Davenport-Besler Corp., Davenport, Iowa.
Porter, H. K., Co. Inc., 49th & Harrison Sts., Pittsburgh, Pa.

LOCOMOTIVES (Storage Battery)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Co., Rochelle, Ill.

LUBRICANTS (Graphite)

Acheson Colloids Corp., Port Huron, Mich.
United States Graphite Co., The, Saginaw, Mich.

LUBRICANTS (Industrial)

Acheson Colloids Corp., Port Huron, Mich.
Cities Service Companies, 70 Pine St., New York City.
Houghton, E. F., & Co., Third, American & Somerset Sts., Philadelphia, Pa.
New York & New Jersey Lubricant Co., 292 Madison Ave., New York City.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Sinclair Refining Co., 630 Fifth Ave., New York City.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Stuart, D. A., Oil Co., Ltd., 2733 S. Troy St., Chicago, Ill.
Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

LUBRICATING SYSTEMS

Farval Corp., The, 3270 E. 80th St., Cleveland, O.

MACHINE WORK

Agerstrand Corp., Muskegon, Mich.
American Metal Products Co., 5959 Lisadale Ave., Detroit, Mich.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Federal Shipbuilding & Dry Dock Co., Kearny, N. J.
Fidelity Machine Co., 3908-18 Frankford Ave., Philadelphia, Pa.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Scaife Co., Ann St., Oakmont, Pa.

MACHINERY (Flexible Shaft)

Walker-Turner Co., Inc., 50102 Berckman St., Plainfield, N. J.

MACHINERY (Special)

American Foundry Equipment Co., The, Mishawaka, Ind.
Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Bayard, M. L., & Co., 20th & Indiana Ave., Philadelphia, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.
Cleveland Automatic Machine Co., 2269 Ashland Ave., Cleveland, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Fidelity Machine Co., 3908-18 Frankford Ave., Philadelphia, Pa.
Foote Bros. Gear & Machine Co., 5301 S. Western Blvd., Chicago, Ill.
Greenlee Bros. & Co., Rockford, Ill.
Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill.
Hepburn American Co., Maher Bldg., Greenwich, Conn.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Broach & Machine Co., 5600 St., Jean, Detroit, Mich.
National-Erie Corp., Erie, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Oil Well Supply Co., Dallas, Texas.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Sellers, William, & Co., Inc., 16th & Callohill Sts., Philadelphia, Pa.
Shuster, F. B., Co., The, New Haven, Conn.
Simmons Machine Tool Corp., 1850 N. Broadway Albany, N. Y.
Standard Machinery Co., Providence, R. I.
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
Yoder Co., The, W. 55th St. & Walworth Ave., Cleveland, O.

MACHINERY (Used & Rebuilt)

Albert, L., & Son, Whitehead Rd., Trenton, N. J.
Galbreath Machinery Co., Empire Bldg., Pittsburgh, Pa.
General Blower Co., 404 N. Peoria St., Chicago, Ill.
Iron & Steel Products, Inc., Hegewisch Sta., Chicago, Ill.
Lang Machinery Co., 28th & A.V.R.R., Pittsburgh, Pa.
Motor Repair & Mfg. Co., 1558 Hamilton Ave., Cleveland, O.
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

MAGNESIA (Electrically Fused)

Norton Co., Worcester, Mass.

MAGNESIA-REFRACTORIES

Basic Refractories, Inc., Hanna Bldg., Cleveland, Ohio.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

MAGNESIUM

Dow Chemical Co., Midland, Mich.

MAGNETIC SEPARATORS—See SEPARATORS (Magnetic)

MAGNETS (Lifting)

Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MAGNETS (Separating)

Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee, Wis.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MANGANESE METAL AND ALLOYS

Electro Metallurgical Co., 30 E. 42nd St., New York City.

MANGANESE ORE

Cuban-American Manganese Corp., 122 E. 42nd St., New York City.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

MANIPULATORS

Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.

MANIPULATORS (Forging)

Alliance Machine Co., The, Alliance, O.

MARKING DEVICES

Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.
Matthews, James H., & Co., 3978 Forbes St., Pittsburgh, Pa.

METAL (Perforated)—See PERFORATED METAL

METAL BLAST ABRASIVES (Shot and Grit)

American Foundry Equipment Co., The 509 S. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., 4839 Harrison St., Pittsburgh, Pa.
Vapor Blast Mfg. Co., 333 S. 16th St., Milwaukee, Wis.

METAL CLEANERS

American Chemical Paint Co., Dept. 310, Ambler, Pa.
Houghton, E. F., & Co., Third, American & Somerset Sts., Philadelphia, Pa.

METAL CLEANERS—Con.

Pennsylvania Salt Mfg. Co., Dept. S. Pennsalt Cleaner Div., Philadelphia, Pa.
Turco Products, Inc., 6135 S. Central Ave., Los Angeles, Calif.
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

METAL CLEANING MACHINES

American Foundry Equipment Co., The, Mishawaka, Ind.
Bullard Co., The, Bridgeport, Conn.
Pangborn Corporation, Hagerstown, Md.
Ransohoff, N., Inc., Elmwood Place, Cincinnati, O.

METAL DUPLICATION (Without Dies)

O'Neil-Irwin Mfg. Co., 304 8th Ave., So., Minneapolis, Minn.

METAL FINISHES

American Nickeloid Co., 1310 N. Second St., Peru, Ill.

METAL FORMING MACHINERY

Ferracute Machine Co., Bridgeton, N. J.
O'Neil-Irwin Mfg. Co., 304 8th Ave., So., Minneapolis, Minn.

METAL SPECIALTIES AND PARTS —See STAMPINGS

METAL STAMPINGS—See STAMPINGS

METALS (Nonferrous)

American Brass Co., The, Waterbury, Conn.
International Nickel Co., Inc., The, 67 Wall St., New York City.

MICROMETERS

Brown & Sharpe Mfg. Co., Providence, R. I.

MILLING CUTTERS

Atkins, E. C., & Co., 427 S. Illinois St., Indianapolis, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

MILLING MACHINE ATTACHMENTS

Kempsmith Machine Co., 1819 S. 71st St., Milwaukee, Wis.

MILLING MACHINES

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, O.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee, Wis.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.
Ohio Machine Tool Co., The, Kenton, O.
Sellers, William, & Co., Inc., 16th & Callowhill Sts., Philadelphia, Pa.
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.
Van Norman Machine Tool Co., Springfield, Mass.

MILLING MACHINES (Milling and Centering Combined)

Jones & Lamson Machine Co., Springfield, Vt.

MILLS (Blooming, Universal, Plate, Sheet, Tin, Bar, Strip, Etc.)—See ROLLING MILL EQUIPMENT

MOLDING MACHINERY (Foundry)

Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

MOLDS (Ingot)—See INGOT MOLDS

MOLYBDENUM

Climax Molybdenum Co., 500 Fifth Ave., New York City.
Molybdenum Corp. of America, Grant Bldg., Pittsburgh, Pa.

MONEL METAL (All Commercial Forms)

International Nickel Co., Inc., The, 67 Wall St., New York City.

MONORAIL SYSTEMS

American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Reading Chain & Block Corp., Dept. D-10, Reading, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

MOTOR-ROLLERS

Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.

MOTOR CONTROLS

Electric Controller & Mfg. Co., The, 2698 E. 79th St., Cleveland, O.

MOTOR CONTROLS (Electric)

Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee, Wis.

MOTORS (Electric)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Century Electric Co., 1806 Pine St., St. Louis, Mo.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., 420 Lexington Ave., New York City.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O.
Reliance Electric & Eng. Co., 1088 Ivanhoe Rd., Cleveland, O.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Walker-Turner Co., Inc., 50102 Berckman St., Plainfield, N. J.
Westinghouse Electric & Mfg. Co., Dept. 7-N. East Pittsburgh, Pa.

MUCK BAR

Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

NAILS

(*Also Stainless)

Alan Wood Steel Co., Conshohocken, Pa.
American Steel and Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Hassall, John, Inc., 402 Oakland St., Brooklyn, N. Y.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Keystone Steel & Wire Co., Dept. AC. Peoria, Ill.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

NAILS (Coated and Galvanized)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Brothers, 189 Main St., Cortland, N. Y.

NAME PLATES

Avery Adhesives, 451 E. 3rd St., Los Angeles, Cal.

NICKEL (All Commercial Forms)

International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL (Shot)

International Nickel Co., Inc., The, 67 Wall St., New York City.

NOZZLES (Blast)

American Foundry Euipment Co., The, 509 S. Byrkit St., Mishawaka, Ind.
Pangborn Corporation, Hagerstown, Md.
Vapor Blast Mfg. Co., 883 S. 16th St., Milwaukee, Wis.

NOZZLES (Descaling)

Aldrich Pump Co., 2 Gordon St., Allentown, Pa.
American Foundry Equipment Co., The, Mishawaka, Ind.

NUTS (*Also Stainless)

Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
*Elastic Stop Nut Corp., 2367 Vauxhall Rd., Union, N. J.
*Harper, H. M. Co., The, 2646 Fletcher St., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Oliver Iron & Steel Corp., So. 10th & Muriel Sts., Pittsburgh, Pa.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Tinnerman Products, Inc., 2039 Fulton Rd., Cleveland, O.

NUTS (Castellated)

Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Acme Co., The, 170 E. 131 St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Machine Screw)

Elastic Stav Nut Corp., 2340A Vauxhall Rd., Union, N. J.
Central Screw Company, 3517 Shields Ave., Chicago, Ill.

NUTS (Non-Ferrous)

Elastic Stop Nut Corp., 2340A Vauxhall Rd., Union, N. J.
Harper, H. M., Co., The, 2646 Fletcher St., Chicago, Ill.

NUTS (Non-ferrous & Stainless)

Elastic Stop Nut Corp., 2340A Vauxhall Rd., Union, N. J.

NUTS (Self Locking)

Elastic Stop Nut Corp., 2367 Vauxhall Rd., Union, N. J.

NUTS (Semi-finished)

Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Wing)

Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Parker-Kalon Corp., 194-200 Varick St., New York City.

OIL SEALS

Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

OILS (Cutting)

Cities Service Companies, 70 Pine St., New York City.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Sinclair Refining Co., 630 Fifth Ave., New York City.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Stuart, D. A., Oil Co. Ltd., 2733 S. Troy St., Chicago, Ill.
Sun Oil Co., Dept. 1, 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

OILS (Lubricating)—See LUBRICANTS (Industrial)

OILS (Quenching)

Park Chemical Co., 8076 Military Ave., Detroit, Mich.

OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)

OVENS (Annealing, Japanning, Tempering)

Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Maehler, Paul, Co., The, 2208 W. Lake St., Chicago, Ill.
Mahr Mfg. Co., Minneapolis, Minn.

OVENS (Coke, By-Product Recovery)

Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

OVENS (Core and Mold)

Bartlett, C. O., & Snow Co., 6200 Harvard Ave., Cleveland, O.
Mahr Mfg. Co., Minneapolis, Minn.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

OVENS (Gas or Oil Heat)

Maehler, Paul, Co., The, 2208 W. Lake St., Chicago, Ill.
Mahr Mfg. Co., Minneapolis, Minn.

OXY-ACETYLENE WELDING AND CUTTING—See WELDING

OXYGEN IN CYLINDERS

Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago, Ill.

PACKING (Asbestos or Rubber)

Carey, Philip, Mfg. Co., The, Lockland, Cincinnati, O.
Johns-Manville Corp., 22 E. 40th St., New York City.

PACKING (Carbon & Graphite)

National Carbon Co., W. 117th St. & Madison Ave., Cleveland, O.

PACKINGS—MECHANICAL LEATHER (Cup, U-Cup, Flange and Vees)

Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

PAINT (Alkali Resisting)

Pensylvania Salt Mfg. Co., Dept. S. Pennsalt Cleaner Div., Philadelphia, Pa.

PAINT (Aluminum)

Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

PAINT (Heat Resisting, Rust Preventing, Priming)

American Chemical Paint Co., Dept. 310, Ambler, Pa.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

PAINT (Industrial)

Carey, Philip, Mfg. Co., The, Lockland, Cincinnati, O.

PAINT (Marking)

Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

PAINT (Stick Form)

Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.

PAINTING

Hanlon-Gregory Galvanizing Co., 5515 Butler St., Pittsburgh, Pa.

PAPER PRODUCTS

Dennison, Dept. 78, War Production Div., Framingham, Mass.

PARTS (Precision)

Elastic Stop Nut Corp., 2340A Vauxhall Rd., Union, N. J.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

PATTERNS (Wood or Metal)

Wellman Bronze & Aluminum Co., The, 6011 Superior Ave., Cleveland, O.

PERFORATED METAL

Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.

PHENOL RECOVERY PLANTS

Koppers Co., Engineering and Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

PICKLING

Hanlon-Gregory Galvanizing Co., 5515 Butler St., Pittsburgh, Pa.

PICKLING COMPOUNDS

American Chemical Paint Co., Dept. 310, Ambler, Pa.
Houghton, E. F., & Co., Third, American & Somerset Sts., Philadelphia, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.
Pennsylvania Salt Mfg. Co., Dept. S. Pennsalt Cleaner Div., Philadelphia, Pa.

PICKLING EQUIPMENT

International Nickel Co., Inc., The, 67 Wall St., New York City.
National Carbon Co., W. 117th St. & Madison Ave., Cleveland, O.
Ransohoff, N., Inc., Elmwood Place, Cincinnati, O.

PICKLING MACHINERY

Aetna-Standard Engineering Co., The, Home Savings Bank Bldg., Youngstown, O.
Erie Foundry Co., Erie, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Wean Engineering Co., Warren, O.

PICKLING TANK LININGS

Ceilcote Co., 750 Rockefeller Bldg., Cleveland, O.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.
National Carbon Co., W. 117th St. & Madison Ave., Cleveland, O.
Pennsylvania Salt Mfg. Co., Dept. S. Pennsalt Cleaner Div., Philadelphia, Pa.

PICKLING TANKS —See TANKS (Pickling)

PIERCER POINTS

Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIG IRON

Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., The, Union Commerce Bldg., Cleveland, O.
Columbia Steel Co., Russ Bldg., San Francisco, Calif.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Jackson Iron & Steel Co., Jackson, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

PILING (Iron and Steel)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.

PILING (Pressure-Treated Wood)

Koppers Co., Wood Preserving Div., 300 Koppers Bldg., Pittsburgh, Pa.

PILLOW BLOCKS (Ball)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Philadelphia, Pa.

PILLOW BLOCKS (Roller Bearing)

Ahlberg Bearing Co., 3015 W. 47th St., Chicago, Ill.
Dodge Manufacturing Corp., Mishawaka, Ind.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Philadelphia, Pa.

PILLOW BOXES

Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

PINIONS (Mill)

Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 25th St., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.

PINS (Taper)

Moltrup Steel Products Co., Beaver Falls, Pa.

PIPE (Brass, Bronze, Copper)

American Brass Co., The, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Lewin-Mathes Co., St. Louis, Mo.
Shenango-Penn Mold Co., 401 W. Third St., Dover, O.

PIPE (Rubber Lined)

American Hard Rubber Co., 11 Mercer St., New York City.

PIPE (Square and Rectangular)

Tubular Service Corp., 120 44th St., Brooklyn, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE (Steel)

Allegheny Ludlum Steel Corp., 2319 Oliver Bldg., (22) Pittsburgh, Pa.
American Rolling Mill Co., The, 3031 Curtis St., Middletown, O.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Crane Co., 836 So. Michigan Ave., Chicago, Ill.
Flori Pipe Co., The, 5700 Bulwer Ave., St. Louis, Mo.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE (Steel, Fabricated)

Flori Pipe Co., The, 5700 Bulwer Ave., St. Louis, Mo.

PIPE BALLS

Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIPE BENDING

Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Flori Pipe Co., The, 5700 Bulwer Ave., St. Louis, Mo.
Grinnell Co., Inc., Providence, R. I.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.

PIPE CUTTING AND THREADING MACHINERY

Aetna-Standard Engineering Co., The, Home Savings Bank Bldg., Youngstown, O.
Landis Machine Co., Waynesboro, Pa.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

PIPE FITTINGS

Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Flori Pipe Co., The, 5700 Bulwer Ave., St. Louis, Mo.
Grinnell Co., Inc., Providence, R. I.
Oil Well Supply Co., Dallas, Texas.
Worthington Pump & Machinery Corp., Harrison, N. J.

PIPE LINES (Riveted and Welded)

Bethlehem Steel Co., Bethlehem, Pa.

PIPE MILL MACHINERY

Aetna-Standard Engineering Co., The, Home Savings Bank Bldg., Youngstown, O.
Taylor-Wilson Mfg. Co., 1200 Thomson Ave., McKees Rocks, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Yoder Co., The, W. 55th St. & Walworth Ave., Cleveland, O.

PIPE (Steel, Fabricated)

Flori Pipe Co., The, 5700 Bulwer Ave., St. Louis, Mo.

PIPE STRAIGHTENING MACHINERY

Aetna-Standard Engineering Co., The, Home Savings Bank Bldg., Youngstown, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Taylor-Wilson Mfg. Co., 1200 Thomson Ave., McKees Rocks, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PIPE TOOLS

Greenfield Tap & Die Corp., Greenfield, Mass.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

PIPING CONTRACTORS

Grinnell Co., Inc., Providence, R. I.
Power Piping Co., Beaver and Western Ave., Pittsburgh, Pa.

PISTON RINGS

American Hammered Piston Ring Div., Koppers Co., Baltimore, Md.

PISTON RODS

Bay City Co., W. 19th and Cranberry Sts., Erie, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Heppenstall Co., Box 8-9, 4620 Hatfield St., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago, Ill.

PISTON RODS—Con.

Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Union Drawn Steel Div., Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., 1st National Bank Bldg., Pittsburgh, Pa.

PLANERS

Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Ohio Machine Tool Co., The, Kenton, O.
Sellers, William, & Co., Inc., 16th & Callowhill Sts., Philadelphia, Pa.

PLANT DISMANTLERS

Hetz Construction Co., Warren, O.

PLATE CASTORS

Hyatt Bearings Div., General Motors Corp., Harrison, N. J.

PLATE LIFTING GRIPS

Downs Crane & Hoist Co., 540 W. Vernon Ave., Los Angeles, Calif.

PLATES (Sheared or Universal)

(*Also Stainless)

*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., 2319 Oliver Bldg., (22) Pittsburgh, Pa.
*American Rolling Mill Co., The, 3031 Curtis St., Middletown, O.
*Bethlehem Steel Co., Bethlehem, Pa.
*Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Levinson Steel Co., The, 33 Pride St., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
*Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PLATES (Stainless Clad)

Allegheny Ludlum Steel Corp., 2319 Oliver Bldg., (22), Pittsburgh, Pa.
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.

PLATES (Steel—Floor)—See FLOORING (Steel)

PLATES (Terne and Tin)—See TIN PLATE

PLATING EQUIPMENT

Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill.
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

PLUGS (Expansion)

Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.

PLUGS (Rolling Mill)

Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

POLE LINE MATERIAL

Oliver Iron & Steel Corp., S. 10th & Muriel Sts., Pittsburgh, Pa.

POLES (Tubular Steel)

National Tube Co., Frick Bldg., Pittsburgh, Pa.

POTENTIOMETERS

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.

POTS (Case Hardening)

Pressed Steel Tank Co., 1461 S. 66th St., Milwaukee, Wis.

POTS (Lead)

Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

POTS (Melting)

Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.

POWER PLANTS (Diesel, Gas Engine, Steam)

Pritchard, J. F., & Co., Dwight Bldg., Kansas City, Mo.

POWER UNITS (Gasoline, Electric, for Industrial Trucks)

Ready-Power Co., The, 3842 Grand River Ave., Detroit, Mich.

PREHEATERS

Babcock & Wilcox Co., The, 85 Liberty St., New York City.

PRESSED METAL PARTS

Stanley Works, The, Pressed Metal Div., New Britain, Conn.
Worcester Pressed Steel Co., 100 Barber St., Worecster, Mass.

PRESSES

Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Galland-Henning Manufacturing Co., 2747 S. 31st St., Milwaukee, Wis.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Standard Machinery Co., Providence, R. I.
Streine Tool & Mfg. Co., New Bremen, O.
Tomkins-Johnson Co., The, Dept. S, 611 N. Mechanic St., Jackson, Mich.
Watson-Stillman Co., Roselle, N. J.

PRESSES (Bending)

Cleveland Crane & Engineering Co., The, Steelweld Machinery Div., The, 1125 E. 283rd St., Wickliffe, O.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Watson-Stillman Co., Roselle, N. J.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

PRESSES, BRIQUETTING (Turnings & Borings)

Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

PRESSES (Extrusion)

Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Hydropress, Inc., 570 Lexington Ave., New York City.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Watson-Stillman Co., Roselle, N. J.

PRESSES (Forging)

Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Hydropress, Inc., 570 Lexington Ave., New York City.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Machinery Co., The, Tiffin, O.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Watson-Stillman Co., Roselle, N. J.

PRESSES (Forming and Braking)

Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Crane & Engineering Co., The, Steelweld Machinery Div., The, 1125 E. 283rd St., Wickliffe, O.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Watson-Stillman Co., Roselle, N. J.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

PRESSES (Hydraulic)

Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Chambersburg Engineering Co., Chambersburg, Pa.
Denison Engineering Co., The, 1160 Dublin Rd., Columbus, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Galland-Henning Manufacturing Co., 2747 S. 31st St., Milwaukee, Wis.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Hydropress, Inc., 570 Lexington Ave., New York City.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Watson-Stillman Co., Roselle, N. J.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.

PRESS (Pneumatic)

Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill.

PRESSES (Punching, Drawing, Coining, Blanking, etc.)

Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

PRESSES (Riveting)

Ferracute Machine Co., Bridgeton, N. J.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill.

PRESSES (Scrap Bundling and Baling)

Galland-Henning Manufacturing Co., 2747 S. 31st St., Milwaukee, Wis.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

PRESSES (Stamping)

Ferracute Machine Co., Bridgeton, N. J.
Zeh & Hahnemann Co., 56 Avenue A, Newark, N. J.

PRESSURE VESSELS

Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Scaife Co., Ann St., Oakmont, Pa.

PRODUCER GAS SYSTEMS—See GAS PRODUCER PLANTS

PROJECTILE BANDS

Lewin-Mathes Co., St. Louis, Mo.

PUG MILLS (For Blast Furnaces and Sintering Plants)

Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.

PULLEYS (Magnetic)

Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

PULVERIZERS

American Pulverizer Co., 1539 Macklind Ave., St. Louis, Mo.
Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Gruendler Crusher & Pulverizer Co., 2920-28 N. Market St., St. Louis, Mo.

PUMP HOUSES

Dravo Corp. (Contracting Div.), Neville Island, Pittsburgh, Pa.

PUMPS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Hydropress, Inc., 570 Lexington Ave., New York City.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.
Roper, The Geo. D., Corp., Rockford, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Boiler Feed)

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Centrifugal)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Brown & Sharpe Mfg. Co., Providence, R. I.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Fuel Injection)

Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.

PUMPS (Hydraulic)

Brown & Sharpe Mfg. Co., Providence, R. I.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Ltd., York, Pa.
Galland-Henning Manufacturing Co., 2747 S. 31st St., Milwaukee, Wis.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Hydropress, Inc., 570 Lexington Ave., New York City.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Racine Tool & Machine Co., Racine, Wis.
Roper, The Geo. D., Corp., Rockford, Ill.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Weinmann Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Reciprocating)

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Rotary)

Brown & Sharpe Mfg. Co., Providence, R. I.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Roper, The Geo. D., Corp., Rockford, Ill.
Weinman Pump & Supply Co., The, 210 Blvd. of the Allies, Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Vacuum)

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Vertical Turbine)

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Layne & Bowler, Inc., Memphis, Tenn.

PUNCHES (Multiple)

Cincinnati Shaper Co., Elam and Garrard Sts., Cincinati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill.

PUNCHING AND SHEARING MACHINERY

Beatty Machine & Mfg. Co., Hammond, Ind.
Chambersburgh Engineering Co., Chambersburg, Pa.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PYROMETER TUBES

Norton Company, Worcester, Mass.

PYROMETERS

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

RACKS (Steel, for Drums & Barrels)

Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.

RAIL BREAKERS

National Roll & Foundry Co., The, Avonmore, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

RAILS (New and Relaying)

Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

RAILS (Steel)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Ryerson, Jos. T. & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

REAMERS

Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Brown Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., The, 1242 E. 49th St., Cleveland, O.
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.

REBUILT EQUIPMENT

Albert, L., & Son, Whitehead Rd., Trenton, N. J.
Crawbuck, John D., Co., Empire Bldg., Pittsburgh, Pa.
Galbreath Machinery Co., Empire Bldg., Pittsburgh, Pa.
General Blower Co., 404 N. Peoria St., Chicago, Ill.
Iron & Steel Products, Inc., Hegewisch Sta., Chicago, Ill.
Lang Machinery Co., 28th & A.V.R.R., Pittsburgh, Pa.
Motor Repair & Mfg. Co., 1558 Hamilton Ave., Cleveland, O
Simmons Machine Tool Corp., 1850 N. Broadway, Albany, N. Y.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

RECEIVERS

Pressed Steel Tank Co., 1461 S. 66th St., Milwaukee, Wis.
Scaife Co., Ann St., Oakmont, Pa.

RECORDERS (Combustion)

Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

RECORDERS (Pressure, Speed, Temperature, Time)

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hays Corp., The, Michigan City, Ind.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

RECTIFIERS (Dry Disc)

Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.

REDUCTION GEARS

Foote Bros. Gear & Machine Co., 5301 S. Western Blvd., Chicago, Ill.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
Link-Belt Co., 2052 W. Hunting Park Ave., Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Worthington Pump & Machinery Corp., Harrison, N. J.

REFRACTORIES (Chrome)

Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

REFRACTORIES (Dolomite)

Basic Refractories, Inc., Hanna Bldg., Cleveland, O.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

REFRACTORIES (Fire Clay)

Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Eureka Fire Brick Works, 1100 B. F. Jones Law Bldg., Pittsburgh, Pa.
Globe Brick Co., The, East Liverpool, O.
Harbison-Walker Refractories Co., 1800 Farmers Bank Bldg., Pittsburgh, Pa.
Illinois Clay Products Co., 214 Barber Bldg., Joliet, Ill.
Ramtite Co., The, Div. of the S. Obermayer Co., 2557 W 18th St., Chicago, Ill.

REFRACTORIES (For High Frequency Furnaces)

Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.

REFRACTORIES (Forsterite)

Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

REFRACTORIES (High Alumina)

Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

REFRACTORIES (Insulating)

Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

REFRACTORIES (Magnesia)

Basic Refractories, Inc., Hanna Bldg., Cleveland, O.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.,

REFRACTORIES (Plastic)

Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.,

REFRACTORIES (Silica)

Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.

REFRACTORIES (Silicon Carbide)

Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., The, Perth Amboy, N. J.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.
Norton Co., Worcester, Mass.

REFRACTORY CEMENT AND CONCRETE

Atlas Lumnite Cement Co., Dept. S., Chrysler Bldg., New York City.
Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh, Pa.,
Johns-Manville Corp., 22 E. 40th St., New York City.

REGULATORS (Pressure)

Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
Hays Corp., The, Michigan City, Ind.

REGULATORS (Temperature)

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The 118 Neponset Ave., Foxboro, Mass.
Hays Corp., The, Michigan City, Ind.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

REINFORCEMENT FABRIC (Electric Welded)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.

RESISTORS (Graphite Disc)

Allen-Bradley Co., 1320 S. 2nd St., Milwaukee, Wis.

RHEOSTATS (Plating)

Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

RINGS (Steel)

Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., Box S-9, 4620 Hatfield St., Pittsburgh, Pa.
King Fifth Wheel Co., 2915 No. Second St., Philadelphia, Pa.
Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.

RINGS (Aluminum, Brass, Bronze)

Shenango-Penn Mold Co., Dover, O.

RINGS (Weldless) (*Also Stainless)

*Midvale Co., The, Nicetown, Philadelphia, Pa.

RIVETERS (Hydraulic—Portable and Stationary)

Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill.

RIVETERS (Pneumatic)

Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill.

RIVETING MACHINERY

Chambersburg Engineering Co., Chambersburg, Pa.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Shuster, F. B., Co., Inc., New Haven, Conn.
Tomkins-Johnson Co., Dept. S, 611 N. Mechanic St., Jackson, Mich.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

RIVETS (*Also Stainless)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., 327 Carnegie Bldg., Pittsburgh, Pa.
Hassall, John, Inc., 402 Oakland St., Brooklyn, N. Y.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Oliver Iron & Steel Corp., S. 10th & Muriel Sts., Pittsburgh, Pa.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
*Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Triplex Screw Co., The, 3317 Grant Ave., Cleveland, O.

RIVETS (Non-Ferrous and Stainless)

Harper, H. M., Co., The, 2646 Fletcher St., Chicago, Ill.

RODS (Alloy)

Ampco Metal, Inc., Dept. S-10, 3830 W. Burnham St., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carpenter Steel Co., Reading, Pa.
Copperweld Steel Co., Warren, O.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

RODS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)

American Brass Co., The, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Bristol Brass Corp., The, Bristol, Conn.
Roebling's John A., Sons Co., Trenton, N. J.
Seymour Manufacturing Co., The, Seymour, Conn.

RODS (Drill)

Allegheny Ludlum Steel Corp., 2319 Oliver Bldg., (22) Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Kloster Steel Corp., 224-228 N. Justine St., Chicago, Ill.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Purdy, A. R., Co., Inc., 792 Greenwich St., New York City.

RODS (Phosphor Bronze)

Seymour Manufacturing Co., The, Seymour, Conn.

RODS (Rounds, Flats and Shapes) (*Also Stainless)

*Allegheny Ludlum Steel Corp., 2319 Oliver Bldg., (22) Pittsburgh, Pa.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Copperweld Steel Co., Warren, O.
*Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.
Youngstown Sheet & Tube Co., The, Youngstown, O.

RODS (Steel and Iron)

Firth-Sterling Steel Co., McKeesport, Pa.
Kloster Steel Corp., 224-228 N. Justine St., Chicago, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.

RODS (Welding)—See WELDING RODS

RODS (Wire)—See WIRE PRODUCTS

ROLL FORMING MACHINES

Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.

ROLLING DOORS & SHUTTERS—See DOORS AND SHUTTERS

ROLLING MILL BEARINGS—See BEARINGS (Rolling Mill)

ROLLING MILL EQUIPMENT

Aetna-Standard Engineering Co., The, Home Savings Bank Bldg., Youngstown, O.
Alliance Machine Co., The, Alliance, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Cold Metal Products Co., The, 2131 Wilson Ave., Youngstown, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Hydropress, Inc., 570 Lexington Ave., New York City.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Foundry Co., The, Avonmore, Pa.
Streine Tool & Mfg. Co., New Bremen, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Yoder Co., The, 55 Walworth Ave., Cleveland, O.

ROLLING MILLS (Consulting, Contracting Engineers)

Hydropress, Inc., 570 Lexington Ave., New York City.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.

ROLLING MILL MACHINERY (Used)

Foster, Frank B., Oliver Bldg., Pittsburgh, Pa.

ROLLING MILL TABLES

Hydropress, Inc., 570 Lexington Ave., New York City.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.

ROLLS (Bending and Straightening)

Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill.
Webb Corp., The, Webb City, Mo.

ROLLS (Sand and Chilled)

Aetna-Standard Engineering Co., The, Home Savings Bank Bldg., Youngstown, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.-Springfield, O.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Steel and Iron)

Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. and Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.-Springfield, O.
Pittsburgh Rolls Div., Blaw-Knox Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Tinning Machine)

American Shear Knife Co., 3rd & Ann Sts., Homestead, Pa.

ROOFING AND SIDING

Johns-Manville Corp., 22 E. 40th St., New York City.

ROOFING AND SIDING (Corrugated and Plain)

American Rolling Mill Co., The, 3031 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carey, Philip, Mfg. Co., The, Lockland, Cincinnati, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
New Jersey Zinc Co., 160 Front St., New York City.
Republic Steel Corp., Dept. ST, Cleveland, O.
Robertson, H. H., Co., Farmers Bank Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Sons, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

ROOFING (Plastic and Liquid)

Carey, Philip, Mfg. Co., The, Lockland, Cincinnati, O.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.

RUBBER GOODS (Mechanical)

United States Ruber Co., 1230 Sixth Ave., New York City.

RUBBER LINING (Hard and Soft)

American Hard Rubber Co., 11 Mercer St., New York City.

RUST PREVENTIVES

Alrose Chemical Co., 80 Clifford St., Providence, R. I.
Dearborn Chemical Co., 310 S. Michigan Ave., Chicago, Ill.
International Rustproof Corp., 12507 Plover Ave., Lakewood, O.
Koppers Co., Tar & Chemical Div., 300 Koppers Bldg., Pittsburgh, Pa.
Smith Oil & Refining Co., Rockford, Ill.

RUST PROOFING PROCESS

Detroit Rex Products Co., 13029 Hillview Ave., Detroit, Mich.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
International Rustproof Corp., 12507 Plover Ave., Lakewood, O.
Udylite Corp., The, 1651 E. Grand Blvd., Detroit, Mich.

SAFE ENDS (Boiler Tube)

National Tube Co., Frick Bldg., Pittsburgh, Pa.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.

SAFETY DEVICES (Electric)

Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
Lintern Corp., The, Lincoln Ave., Berea, O.

SALT TABLETS

Morton Salt Co., 310 So. Michigan Ave., Chicago, Ill.

SAND BLAST EQUIPMENT

Pangborn Corporation, Hagerstown, Md.

SAND CONDITIONING AND PREPARING MACHINERY

American Foundry Equipment Co., The, 509 S. Byrkit St., Mishawaka, Ind.
Bartlett, C. O., & Snow Co., 6200 Harvard Ave., Cleveland, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Vapor Blast Mfg. Co., 333 S. 16th St., Milwaukee, Wis.

SAWING MACHINES (Contour)

Continental Machines, Inc., 1324 S. Washington Ave., Minneapolis, Minn.

SAWING MACHINES (Hack)

Racine Tool & Machine Co., Racine, Wis.

SAWING MACHINES (Hot and Cold)

Armstrong-Blum Mfg. Co., 5700 Bloomingdale Ave., Chicago, Ill.

Morgan Engineering Co., The, Alliance, O.
Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.
Racine Tool & Machine Co., Racine, Wis.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Wells Mfg. Co., Three Rivers, Mich.

SAWS (Band—Metal Cutting)

Atkins, E. C., & Co., 427 S. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Huther Bros. Saw & Mfg. Co., 1290 University Ave., Rochester, N. Y.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Wells Mfg. Co., Three Rivers, Mich.

SAWS (Hack)

Armstrong-Blum Mfg. Co., 5700 Bloomingdale Ave., Chicago, Ill.
Atkins, E. C., & Co., 427 S. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

SAWS (Hot and Cold)

Atkins, E. C., & Co., 402 S. Illinois St., Indianapolis, Ind.
Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.

SAWS (Inserted Tooth, Cold)

Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

SAWS (Metal Cutting)

Atkins, E. C., & Co., 402 S. Illinois St., Indianapolis, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Wells Mfg. Co., Three Rivers, Mich.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SAWS (Segmental)

Atkins, E. C., & Co., 427 S. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, O.

SCAFFOLDING (Tubular)

Dravo Corp. (Machinery Div.) 300 Penn Ave., Pittsburgh, Pa.

SCALES

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.

SCALES (Dial & Recording)

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.

SCALES (Laboratory)

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.

SCALES (Monorail)

American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

SCRAP BALING PRESSES—See BALING PRESSES

SCREENS AND SIEVES

Bartlett, C. O., & Snow Co., 6200 Harvard Ave., Cleveland, O.
Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Koppers Co., Engineering & Construction Div., 901 Koppers Bldg., Pittsburgh, Pa.

SCREW EXTRACTORS

Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW MACHINE PRODUCTS

Hindley Mfg. Co., Valley Falls, R. I.
National Acme Co., The, 170 E. 131st St., Cleveland, O.

SCREW MACHINES (Automatic, Single and Multiple Spindle)

Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Machine Co., 2269 Ashland Ave., Cleveland, O.
Cone Automatic Machine Co., Inc., Windsor, Vt.
Greenlee Bros. & Co., Rockford, Ill.
National Acme Co., The, 170 E. 131st St., Cleveland, O.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

SCREW PLATES

Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW STOCK—See STEEL (Screw Stock)

SCREWS (Cap, Set, Safety-Set)

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Acme Co., The, 170 E. 131st St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Cold Headed)

Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Cleveland Cap Screw Co., 2917 E. 79th St., Cleveland, O.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

SCREWS (Conveyor)

Lee Spring Co. Inc., 30 Main St., Brooklyn, N. Y.

SCREWS (Hardened Metallic Drive)

Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Hardened Self-Tapping)

Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Machine)

Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.

SCREWS (Machine, Recessed Head)

American Screw Co., Providence, R. I.
Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
International Screw Co., Detroit, Mich.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., 194-200 Varick St., New York City.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

SCREWS (Non-Ferrous and Stainless)

Harper, H. M., Co., The, 2646 Fletcher St., Chicago, Ill.

SCREWS (Sheet Metal, Recessed Head)

American Screw Co., Providence, R. I.
Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker-Kalon Corp., 194-200 Varick St., New York City.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Shakeproof Lock Washer Co., Chicago, Ill.

SCREWS (Socket, Cold Forged)

Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Thread-Cutting)

Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Thumb)

Central Screw Company, 3517 Shields Ave., Chicago, Ill.
Parker-Kalon Corp., 194-200 Varick St., New York City.

SCREWS (Wood, Recessed Head)

American Screw Co., Providence, R. I.
Bristol Co., Waterbury, Conn.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
National Screw & Mfg. Co., 2440 E. 75th St., Cleveland, O.
Parker, Charles, Co., The, Meriden, Conn.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Southington Hardware, Mfg. Co., Southington, Conn.
Whitney Screw Co., Nashua, N. H.

SCRUBBERS (Gas or Air)—see GAS SCRUBBERS

SEALS (Oil & Grease)

Chicago Rawhide Mfg. Co., 900 Alpine Ave., Detroit, Mich.

SEAMLESS STEEL TUBING—
See TUBING (Seamless Steel)

SEPARATORS (Magnetic)

Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

SHAFT HANGERS—See HANGERS (Shaft)

SHAFTING

Bliss & Laughlin, Inc., Harvey, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Chicago, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Union Drawn Steel Div., Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHAFTING (Flexible)

Walker-Turner Co., Inc., 50102 Berckman St., Plainfield, N. J.

SHAPERS

Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Ohio Machine Tool Co., The, Kenton, O.

SHAPES (Steel)—See STEEL (Structural)

SHAPES, SPECIAL (Steel)

Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Pressed Steel Tank Co., 1461 S. 66th St., Milwaukee, Wis.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Drawn Steel Div., Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHEAR BLADES

American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Hepnenstall Co., Box S-9, 4620 Hatfield St., Pittsburgh, Pa.
Ohio Knife Co., Dreman Ave. & B. & O. R.R., Cincinnati, O.

SHEARS

Aetna-Standard Engineering Co., The, Home Savings Bank Bldg., Youngstown, O.
Beatty Machine & Mfg. Co., Hammond, Ind.
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hallden Machine Co., The, Thomaston, Conn.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., 304 8th Ave. S. Minneapolis, Minn.
Streine Tool & Mfg. Co., New Bremen, O.
Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SHEARS, ROTARY (Slitting, Beveling, Circling, Flanging)

Hydropress, Inc., 570 Lexington Ave., New York City.

SHEET BARS

Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEET LIFTERS AND CARRIERS

American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cullen-Friestedt Co., 1308 S. Kilbourn Ave., Chicago, Ill.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
J-B Engineering Sales Co., 3100 East St., New Haven, Conn.

SHEET METAL PRODUCTS—See STAMPINGS

SHEET METAL WORKERS MACHINES

Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.

SHEET STEEL PILING (New and Used)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Inland Steel Co., 33 S. Dearborn St., Chicago, Ill.

SHEETS (Acid Resisting)

International Nickel Co., Inc., The, 67 Wall St., New York City.

SHEETS (Black)

Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., 327 Carnegie Bldg., Pittsburgh, Pa.
Columbia Steel Co., Russ Bldg., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Superior Sheet Steel Div., Continental Steel Corp., Canton, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SHEETS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)

American Brass Co., The, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Bristol Brass Corp., The, Bristol, Conn.

SHEETS (Corrugated)

American Rolling Mill Co., The, 3031 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Deep Drawing and Stamping)

Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., The, 3031 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O

SHEETS (Electrical)

Allegheny Ludlum Steel Corp., 2319, Oliver Bldg., (22), Pittsburgh, Pa.
American Rolling Mill Co., The, 3031 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc. Div., Borg-warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Galvanized)

American Rolling Mill Co., The 3031 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Superior Sheet Steel Div., Continental Steel Corp., Canton, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Hot Rolled and Hot Rolled Annealed)

Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., The, 3031 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Levinson Steel Co., The, 38 Pride St., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.

SHEETS (Hot Rolled and Hot Rolled Annealed)—Con.

Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Weirton Steel Co., Weirton, W. Va.
Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Lead Coated)

Continental Steel Corp., Kokomo, Ind.
Superior Sheet Steel Div., Continental Steel Corp., Canton, O.

SHEETS (Long Terne)

Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Steel Corp., Kokomo, Ind.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Superior Sheet Steel Div., Continental Steel Corp., Canton, O.
Weirton Steel Co., Weirton, W. Va.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHEETS (Manganese Steel)

Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

SHEETS (Nickel Silver)

Seymour Manufacturing Co., The, Seymour, Conn.

SHEETS (Perforated)

Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.

SHEETS (Phosphor Bronze)

Seymour Manufacturing Co., The, Seymour, Conn.

SHEETS (Reinforced)

Erdle Perforating Co., 171 York St., Rochester, N. Y.

SHEETS (Roofing)—See ROOFING AND SIDING

SHEETS (Stainless)

Allegheny Ludlum Steel Corp., 2319, Oliver Bldg., (22), Pittsburgh, Pa.
American Rolling Mill Co., The, 3031 Curtis St., Middletown, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Massillon, O.
Ryerson, Jos. T., & Son, Inc. 16th & Rockwell Sts., Chicago, Ill.

SHEETS (Stainless Clad)

Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.

SHEETS (Tin)—See TIN PLATE

SHEETS (Tin Mill Black)

Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

SHEETS—HIGH FINISH (Automobile, Metal Furniture, Enameling)

American Rolling Mill Co., The, 3031 Curtis St., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., 2243-2244 Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SHELL BANDS (Rotating)

Lewin-Mathes Co., St. Louis, Mo.

SHELLS (Seamless Drawn)

Crosby Co., The, 183 Pratt St., Buffalo, N. Y.
Pressed Steel Tank Co., 1461 S. 66th St., Milwaukee, Wis.

SHIMS (Laminated)

Laminated Shim Co., Inc., 87 Union St., Glenbrook, Conn.

SHOVELS (Power)

Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

SIEVES—See SCREENS AND SIEVES

SIGNALING & INTER-COMMUNICATION EQUIPMENT

Graybar Electric Co., 420 Lexington Ave., New York City.

SIGNS (Metal)

Webb Corp., The, Webb City, Mo.

SILICO-MANGANESE

Electro Metallurgical Co., 30 E. 42nd St., New York City.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.

SILICON METAL AND ALLOYS

Electro Metallurgical Co., 30 E. 42nd St., New York City.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

SKELP (Steel)

Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SLAG GRANULATING MACHINES (Blast Furnace and Open Hearth)

Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

SLEEVES (Piston, Pump & Shaft)

Shenango-Penn Mold Co., Dover, O.

SLITTERS

Cowles Tool Co., 2086 W. 110th St., Cleveland, O.
Ohio Knife Co., Dremen Ave. & B. & O. R.R., Cincinnati, O.

SMALL TOOLS

Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., The, 1242 E. 49th St., Cleveland, O.

SOAKING PITS

Amsler-Morton Co., The, Fulton Bldg., Pittsburgh, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Div. of General Properties Co., Inc., 2375 Dorr St., Toledo, O.

SOLDER

Kester Solder Co., 4222 Wrightwood Ave., Chicago, Ill.

SOLENOIDS (Electric)

Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

SOLVENT (Degreasing)

Detroit Rex Products Co., 13029 Hillview Ave., Detroit, Mich.
Pennsylvania Salt Mfg. Co., Dept. S. Pennsalt Cleaner Div., Philadelphia, Pa.

SPACING TABLES

Thomas Machine Mfg. Co., Etna Branch P. O., Pittsburgh, Pa.

SPECIAL MACHINERY—See MACHINERY (Special)

SPEED REDUCERS

Cleveland Worm & Gear Co., 3270 E. 80th St., Cleveland, O.
Foote, Brad, Gear Works, Cicero, Ill.
Foote Bros. Gear & Machine Co., 5301 S. Western Blvd., Chicago, Ill.
Grant Gear Works, 2nd & B. Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5112 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1120 W. Monroe St., Chicago, Ill.
Jones, W. A., Fdry. & Mach. Co., 4437 Roosevelt Rd., Chicago Ill.
Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
New Departure Div., General Motors Corp., Bristol, Conn.
Philadelphia Gear Works, Erie Ave. & G. St., Philadelphia, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

SPIEGELEISEN

Electro Metallurgical Co., 30 E. 42nd St., New York City.
New Jersey Zinc Co., 160 Front St., New York City.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

SPIKES (Screw)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

SPINDLE SHAPERS (For Non-Ferrous Metal, Plastics & Wood)

Walker-Turner Co., Inc., 50102 Berckman St., Plainfield, N. J.

SPINDLES (Grinding)

Bryant Chucking Grinder Co., Springfield, Vt.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Heald Machine Co., Worcester, Mass.

SPINDLES (Lathe)

American Hollow Boring Co., 1034 W. 20th St., Erie, Pa.

SPLICE BARS (Rail)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SPRINGS (*Also Stainless)

*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
*Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
*Raymond Mfg. Co., Div. Associated Spring Corp., 280 S. Centre St., Corry, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.

SPRINGS (Alloy)

Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 S. Centre St., Corry, Pa.

SPRINGS (Coil & Elliptic)

Barnes, Wallace Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 S. Centre St., Corry, Pa.

SPRINGS (Compression)

Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 S. Centre St., Corry, Pa.

SPRINGS (Flat Coiled)

Washburn Wire Co., 118th & Harlem River, New York City.

SPRINGS (Oil Tempered—Flat)

Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 S. Centre St., Corry, Pa.

SPRINGS (Torsion)

Barnes, Wallace, Co., The, Div. Associated Spring Corp. 97 Main St., Bristol, Conn.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 S. Centre St., Corry, Pa.

SPRINGS (Valve)

Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Raymond Mfg. Co. Div. Associated Spring Corp., 280 S. Centre St., Corry, Pa.

SPRINKLERS (Automatic)

Grinnell Co., Inc., Providence, R. I.

SPRUE CUTTERS

Ferracute Machine Co., Bridgeton, N. J.
Shuster, F. B., Co., The, New Haven, Conn.

STACKS (Steel)—See BRIDGES, ETC.

STAINLESS STEEL—See listings marked "*" under individual product headings)

STACKING MACHINES (Hand & Electric)

Economy Engineering Co., 2657 W. Van Buren St., Chicago, Ill.

STAMPINGS

American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Crosby Co., The, 185 Pratt St., Buffalo, N. Y.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
Dayton-Rogers Mfg. Co., Dept. C., 2830 13th Ave. So., Minneapolis, Minn.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.
Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.
Pressed Steel Tank Co., 1461 S. 66th St., Milwaukee, Wis.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 S. Centre St., Corry, Pa.
Scaife Co., Ann St., Oakmont, Pa.
Spriesch Tool & Mfg. Co., 10 Howard St., Buffalo, N. Y.
Stanley Works, The, Bridgeport, Conn. New Britain, Conn.
Toledo Stamping & Mfg. Co., 90 Fearing Blvd., Toledo, O.
Whitehead Stamping Co., 1667 W. Lafayette Blvd., Detroit, Mich.
Worcester Pressed Steel Co., 100 Barber St., Worcester, Mass.

STAMPS (Steel)

Cunningham, M. E., Co., 172 E. Carson St., Pittsburgh, Pa.
Matthews, James H., & Co., 3978 Forbes St., Pittsburgh, Pa.

STAPLES (Wire)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., The Youngstown, O.

STARTERS (Electric Motor)

Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2698 East 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

STEEL

Alan Wood Steel Co., Conshohocken, Pa.

STEEL (Alloy)

Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., 2319 Oliver Building (22) Pittsburgh, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Reading, Pa.
Columbia Steel Co., San Francisco, Calif.
Copperweld Steel Co., Warren, O.
Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Heppenstall Co., Box S-9, 4620 Hatfield St., Pittsburgh, Pa.
Jessop Steel Co., 584 Green St., Washington, Pa.
Kloster Steel Corp., 224-228 N. Justine St., Chicago, Ill.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Washburn Wire Co., Phillipsdale, R. I.

STEEL (Alloy, Cold Finished)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Copperweld Steel Co., Warren, O.
Firth-Sterling Steel Co., McKeesport, Pa.
LaSalle Steel Co., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Purdy, A. R., Co., Inc., 792 Greenwich St., New York City.
Union Drawn Steel Div. of Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Clad—Corrosion Resisting) (*Also Stainless)

*Copperweld Steel Co., Warren, O.
*Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Jessop Steel Co., 584 Green St., Washington, Pa.
Superior Steel Corp., Carnegie, Pa.

STEEL (Cold Drawn)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Roebling's John A., Sons Co., Trenton, N. J.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Union Drawn Steel Div. of Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Cold Finished)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Purdy, A. R., Co., Inc., 792 Greenwich St., New York City.
Roebling's, John A., Sons Co., Trenton, N. J.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Union Drawn Steel Div. of Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Corrosion Resisting)

Allegheny Ludlum Steel Corp., 2319, Oliver Bldg., (22), Pittsburgh, Pa.
American Rolling Mill Co., The, 3031 Curtis St., Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 945 E. 67th St., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., 139 Bern St., Reading, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Ryerson, Jos. T., & Son., Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.

STEEL (Die)

Allegheny Ludlum Steel Corp., 2319 Oliver Building (22), Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.
Disston Henry, & Sons, Inc. 926 Tacony,, Philadelphia, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Ziv Steel & Wire Co., 2945 W. Harrison St., Chicago, Ill.

STEEL (Electric)

Allegheny Ludlum Steel Corp., 2319 Oliver Building (22), Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Copperweld Steel Co., Warren, O.
Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.

STEEL (High Speed)

Allegheny Ludlum Steel Corp., 2319, Oliver Bldg., (22), Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., 139 Bern St., Reading, Pa.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.
Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Jessop, Wm., & Sons Co., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL (High Tensile, Low Alloy)

Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cold Metal Products Co., The, 2131 Wilson Ave., Youngstown, O.
Columbia Steel Co., San Francisco, Calif.

STEEL (High Tensile, Low Alloy)—Con.

Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL, NICKEL (Cold Drawn)

Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Republic Steel Co., Dept. ST. Cleveland, O.
Union Drawn Steel Div., Republic Steel Corp., Massillon, O.

STEEL (Nitriding)

Allegheny Ludlum Steel Corp., 2319, Oliver Bldg., (22), Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.

STEEL (Rustless)—See STEEL (Corrosion Resisting)

STEEL (Screw Stock)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., 545 W. McCarty St., Indianapolis, Ind.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Div. of Republic Steel Corp., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Spring)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Cold Metal Products Co., The, 2131 Wilson Ave., Youngstown, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Purdy, A. R., Co., Inc., 792 Greenwich St., New York City.
Roebling's, John A., Sons Co., Trenton, N. J.
Washburn Wire Co., 118th St. & Harlem River, New York City, Phillipsdale, R. I.

STEEL (Stainless)—See STEEL (Corrosion Resisting)

STEEL (Strapping)

Atkins, E. C., & Co., 427 S. Illinois St., Indianapolis, Ind.

STEEL (Strip, Brass, Bronze Copper and Nickel Coated)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Thomas Steel Co., The, Warren, O.

STEEL (Strip, Hot and Cold Rolled)

(*Also Stainless)

*Allegheny Ludlum Steel Corp., 2319, Oliver Bldg., (22), Pittsburgh, Pa.
*American Rolling Mill Co., The, 3031 Curtis St., Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
*Carpenter Steel Co., Reading, Pa.
Cold Metal Products Co., The, 2131 Wilson Ave., Youngstown, O.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
*Firth-Sterling Steel Co., McKeesport, Pa.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 627-629 Sith Ave., New York City.
Jessop Steel Co. 584 Green St., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland. O.
Roebling's, John A., Sons Co., Trenton, N. J.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
*Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
*Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Thomas Steel Co., The, Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City, Phillipsdale, R. I.
Weirton Steel Co., Weirton, W. Va.
Worcester Pressed Steel Co., 100 Barber St., Worcester, Mass.

STEEL (Strip, Tin Coated)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Thomas Steel Co., The, Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Strip, Zinc Coated)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Thomas Steel Co., The, Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Structural)

(*Also Stainless)

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Belmont Iron Works, 22nd St. and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
*Carnegie-Illinois Steel Corp. Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2525 E. Cumberland St., Philadelphia, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Levinson Steel Co., The, 33 Pride St., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
*Scully Steel Products Co., 1316 Wabansia Ave., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Tool)

Allegheny Ludlum Steel Corp., Dept. 2319, Oliver Bldg., (22), Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 947 E. 67th St., Cleveland, O.
Carpenter Steel Co., 139 Bern St., Reading, Pa.
Copperweld Steel Co., Warren, O.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.
Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill.
Jessop, Wm., & Sons Co., 627-629 Sixth Ave., New York City.
Jessop Steel Co., 584 Green St., Washington, Pa.
Kloster Steel Corp., 224-228 N. Justine St., Chicago, Ill.
Latrobe Electric Steel Co., Latrobe, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Broach & Mach. Co., 5600 St. Jean, Detroit, Mich.
Purdy, A. R., Co., Inc., 792 Greenwich St., New York City.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron and Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL BUILDINGS—See BRIDGES, BUILDINGS, ETC.

STEEL DOORS & SHUTTERS—See DOORS & SHUTTERS

STEEL FABRICATORS—See BRIDGES, BUILDINGS, ETC.

STEEL FLOATING AND TERMINAL EQUIPMENT

Dravo Corp. (Engineering Works Div.), Neville Island, Pittsburgh, Pa.

STEEL PLATE CONSTRUCTION

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
General American Transportation Corp., 135 S. LaSalle, St., Chicago, Ill.
Graver Tank & Mfg. Co., Inc., 4809-40 Tod Ave., E. Chicago, Ind.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Western Gas. Div., Koppers Co., Fort Wayne, Ind.

STELLITE

Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

STENCILS (Spray and Sand Blast)

Matthews, James H., & Co., 3978 Forbes St., Pittsburgh, Pa.

STICKERS (Identification, Instruction, Rejection)

Avery Adhesives, 451 E. 3rd St., Los Angeles, Calif.

STOKERS

Babcock & Wilcox Co., The, Refractories Div., 85 Liberty St., New York City.
Link-Belt Co., 2410 W. 18th St., Chicago, Ill.

STONES (Honing)

Bay State Abrasive Products Co., Westboro, Mass.
Norton Company, Worcester, Mass.

STOPPERS (Cinder Notch)

Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

STOPPERS (Rubber)

Rhoades, R. W., Metaline Co., 50-17 Fifth St., Long Island City, N. Y.

STORAGE EQUIPMENT

Graver Tank & Mfg. Co., Inc., 4809-40 Tod Ave., E. Chicago, Ind.

STORAGE BATTERIES—See BATTERIES (Storage)

STRAIGHTENING MACHINERY

Aetna-Standard Engineering Co., The, Home Savings Bank Bldg., Youngstown, O.
American Foundry Equipment Co., The, Mishawaka, Ind.
Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Farquhar, A. B., Co., Ltd., 195 Duke St., York, Pa.
Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Hydropress, Inc., 570 Lexington Ave., New York City.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Logemann Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Shuster, F. B., Co., The, New Haven, Conn.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.

SULPHURIC ACID

Cleveland-Cliffs Iron Co., The, Union Commerce Bldg., Cleveland, O.
New Jersey Zinc Co., 160 Front St., New York City.
Pennsylvania Salt Mfg. Co., Dept. S, Pennsalt Cleaner Div., Philadelphia, Pa.

SURFACE WELDING

Wall-Colmonoy Corp., 637 Buhl Bldg., Detroit, Mich.

SWAGING MACHINES

Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.
Ferracute Machine Co., Bridgeton, N. J.
Standard Machinery Co., Providence, R. I.
Torrington Co., The, Torrington, Conn.

SWITCHES (Electric)

Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2700 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

TABLES (Elevating)

Lyon-Raymond Corp., 131 Madison St., Greene, N. H.

TACHOMETERS

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hays Corp., The, Michigan City, Ind.

TANK LININGS

Ceilcote Co., 750 Rockefeller Bldg., Cleveland, O.
National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.

TANKS (Gas Auxiliary)

Webb Corp., The, Webb City, Mo.

TANKS (Pickling)

National Carbon Co., W. 117th St. and Madison Ave., Cleveland, O.
United States Rubber Co., 1230 Sixth Ave., New York City.

TANKS (Storage, Pressure, Riveted, Welded)

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
General American Transportation Corp., 135 S. LaSalle St., Chicago, Ill.
Graver Tank & Mfg. Co., Inc., 4809-40 Tod Ave., E. Chicago, Ind.
Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.
Pressed Steel Tank Co., 1461 S. 66th St., Milwaukee, Wis.
Scaife Co., Ann St., Oakmont, Pa.
Western Gas Div., Koppers Co., Fort Wayne, Ind.

TANKS (Wood or Steel, Rubber or Lead Lined)

American Hard Rubber Co., 11 Mercer St., New York City.

TAPES (Adhesive-Paper, Cloth, Fibre, Acetate, Film Backing)

Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul, Minn.

TAPS AND DIES

Detroit Tap & Tool Co., 8432 Butler St., Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., The, 170 E. 131st St., Cleveland, O.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

TERMINALS (Locking)

Thompson-Bremer & Co., 1644 W. Hubbard St., Chicago, Ill.

TERNE PLATE—See TIN PLATE

TESTING MACHINERY (Materials)

Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia, Pa.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
National Broach & Machine Co., 5600 St. Jean, Detroit, Mich.

THERMIT WELDING

Metal & Thermit Corp., 120 Broadway, New York City.

THERMOMETERS

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Brown Instrument Div. of Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4957 Stenton Ave., Philadelphia, Pa.

THREAD CUTTING TOOLS

Detroit Tap & Tool Co., 8432 Butler St., Detroit, Mich.
Landis Machine Co., Waynesboro, Pa.
Oster Mfg. Co., The, 2037 E. 61st St., Cleveland, O.

TIE PLATES

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

TIN PLATE

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TIN PLATE MACHINERY

Aetna-Standard Engineering Co., The, Home Savings Bank Bldg., Youngstown, O.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Wean Engineering Co., Warren, O.

TITANIUM

Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

TONGS (Automatic)

Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.

TONGS (Chain Pipe)

Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

TONGS (Rail Handling)

Cullen-Friestedt Co., 1308 S. Kilbourn Ave., Chicago, Ill.

TOOL BITS (High Speed)

Allegheny Ludlum Steel Corp., 2319, Oliver Bldg., (22) Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Disston, Henry, & Sons, Inc., 926 Tacony, Philadelphia, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Jessop Steel Co., 584 Green St., Washington, Pa.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Midvale Co., The, Nicetown, Philadelphia, Pa.

TOOL HOLDERS

Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.
South Bend Lathe Works, Dept. 893, South Bend, Ind.

TOOLS (Non-Sparking, Safety)

Ampco Metal, Inc., 3830 W. Burnham St., Dept. S-10, Milwaukee, Wis.

TOOLS (Pneumatic)

Cleveland Punch & Shear Works Co., The, 3917 St. Clair Ave., Cleveland, O.

TOOLS (Precision, Lathe, Metal Cutting, etc.)

Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Gisholt Machine Co., 1217 E. Washington Ave., Madison, Wis.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TOOLS (Steel-Cutting)

Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TOOLS (Tipped, Carbide)

Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TOOLS (Turning, Boring and Facing)

Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.
South Bend Lathe Works, Dept. 893, South Bend, Ind.

TORCHES & BURNERS (Acetylene, Blow, Oxy-Acetylene)

Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago, Ill.

TOWBOATS

Dravo Corp. (Engin'r'g Works Div.) Neville Island, Pittsburgh, Pa.

TOWERS (Cooling)

Pritchard, J. F., & Co., Dwight Bldg., Kansas City, Mo.

TOWERS (Transmission)

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

TOWERS (Tubular Hoisting)

Dravo Corp., (Machinery Div.) 300 Penn Ave., Pittsburgh, Pa.

TRACK ACCESSORIES

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Oliver Iron & Steel Corp., S. 10th & Muriel Sts., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

TRACK BOLTS

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Lamson & Sessions Co., The, 1971 W. 85th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TRAILERS

Easton Car & Construction Co., Easton, Pa.
Mercury Manufacturing Co., 4140 S. Halsted St., Chicago, Ill.
Ohio Galvanizing & Mfg. Co., Penn St., Niles, O.

TRAMRAILS

American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., 1125 E. 283rd St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.

TRANSFORMERS (Electric)

General Electric Co., Schenectady, N. Y.

TRANSMISSIONS—VARIABLE SPEED

Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

TREADS (Safety)

Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Dravo Corp. (Machinery Div.), 300 Penn Ave., Pittsburgh, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Norton Company, Worcester, Mass.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., 5515 Butler St., Pittsburgh, Pa.

TROLLEYS

American MonoRail Co., The, 13102 Athens Ave., Cleveland, O.
Ford Chain Block Div., American Chain & Cable Co. Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Reading Chain & Block Corp., Dept. D-10, Reading, Pa.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.

TRUCK CRANES

Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.
Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

TRUCKS AND TRACTORS (Electric Industrial)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Easton Car & Construction Co., Easton, Pa.
Elwell-Parker Electric Co., The, 4205 St. Clair Ave., Cleveland, O.
Mercury Manufacturing Co., 4140 S. Halsted St., Chicago, Ill.
Towmotor Co., 1247 E. 152nd St., Cleveland, O.

TRUCKS AND TRACTORS (Gasoline, Diesel)

Silent Hoist Winch & Crane Co., 849 63rd St., Brooklyn, N. Y.

TRUCKS AND TRACTORS (Gasoline, Industrial)

Baker-Raulang Co., The, 2167 W. 25th St., Cleveland, O.
Buda Co., The, Harvey, Ill.
Clark Trucktractor Div., Clark Equipment Co., 127 Springfield Place, Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4205 St. Clair Ave., Cleveland, O.
Mercury Manufacturing Co., 4140 S. Halsted St., Chicago, Ill.
Towmotor Co., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Dump-Industrial)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Easton Car & Construction Co., Easton, Pa.
Towmotor Co., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Hydraulic Lift)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Baker-Raulang Co., The, 2168 W. 25th St., Cleveland, O.
Elwell-Parker Electric Co., The, 4205 St. Clair Ave., Cleveland, O.
Equipment Co., 127 Springfield Place, Battle Creek, Mich.
Lyon Raymond Corp., 131 Madison St., Greene, N. Y.
Towmotor Co., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Industrial)

Baker-Raulang Co., The, 2168 W. 25th St., Cleveland, O.
Buda Co., The, Harvey, Ill.
Easton Car & Construction Co., Easton, Pa.
Mercury Manufacturing Co., 4140 S. Halsted St., Chicago, Ill.
Ohio Galvanizing & Mfg. Co., Penn St., Niles, O.

TRUCKS (Lift)

Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.
Baker-Raulang Co., The, 2168 W. 25th St., Cleveland, O.
Clark Trucktractor Div., Clark Equipment Co., 127 Springfield Pl., Battle Creek, Mich.
Easton Car & Construction Co., Easton, Pa.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Lyon-Raymond Corp., 131 Madison St., Greene, N. Y.
Mercury Manufacturing Co., 4140 S. Halsted St., Chicago, Ill.
Towmotor Co., 1247 E. 152nd St., Cleveland, O.

TUBING (Alloy Steel)

*Flori Pipe Co., The, 5700 Bulwer Ave., St. Louis, Mo.

TUBE FITTINGS

Weatherhead Co., The, 300 East 131st St., Cleveland, O.

TUBE MILL EQUIPMENT

Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Taylor-Wilson Mfg. Co., 1200 Thomson Ave., McKees Rocks, Pa.
Yoder Co., The, W. 55th & Walworth Ave., Cleveland, O.

TUBE MILL MACHINERY

Aetna-Standard Engineering Co., The, Home Savings Bank Bldg., Youngstown, O.

TUBE WELDING MACHINES

Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.

TUBES (Boiler)

Allegheny Ludlum Steel Corp., 2319 Oliver Bldg., (22), Pittsburgh, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 947 E. 67th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
Ryerson Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBES (Brass, Bronze, Copper, Nickel Silver)

American Brass Co., The, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Shenango-Penn Mold Co., Dover, O.

TUBES (High Carbon)

Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Ohio Seamless Tube Co., Shelby, O.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.

TUBING (Alloy Steel)

(*Also Stainless)

*Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bissett Steel Co., The, 947 E. 67th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
*Flori Pipe Co., The, 5700 Bulwer Ave., St. Louis, Mo.
*National Tube Co., Frick Bldg., Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.

TUBING (Aluminum, Brass, Copper)

American Brass Co., The, Waterbury, Conn.
Lewin-Mathes Co., St. Louis, Mo.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Shenango-Penn Mold Co., 401 W. Third St., Dover, O.

TUBING (Flexible Metal)

Chicago Metal Hose Corp., 1315 S. Third St., Maywood, Ill.

TUBING (Monel)

Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich

TUBING (Seamless Flexible Metal)

American Metal Hose Branch of The American Brass Co., Waterbury, Conn.

TUBING (Seamless Steel)

Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Timken Roller Bearing Co., The, Steel & Tube Div., Canton, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBING (Square, Rectangular and Shapes)

(*Also Stainless)

*Carpenter Steel Co., Reading, Pa.
Ohio Seamless Tube Co., Shelby, O.
Steel & Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.

TUBING (Welded Steel)

(*Also Stainless)

Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
*Carpenter Steel Co., Reading, Pa.
Flori Pipe Co., The, 5700 Bulwer Ave., St. Louis, Mo.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., (P. O. Box 132), Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
Republic Steel Corp., Dept. ST, Cleveland, O.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBULAR PRODUCTS

Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
National Tube Co., Frick Bldg., (P. O. Box 132), Pittsburgh, Pa.
Ohio Seamless Tube Co., Shelby, O.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Steel and Tubes Division, Republic Steel Corp., 226 E. 131st St., Cleveland, O.
Tubular Service Corp., 120 44th St., Brooklyn, N. Y.

TUMBLING BARRELS (Coke Testing)

Brosius, Edgar E., Co., Sharpsburg Branch, Pittsburgh, Pa.

TUNGSTEN CARBIDE

Bissett Steel Co., The, 947 E. 67th St., Cleveland, O.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

TUNGSTEN CARBIDE (Tools and Dies)

Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TUNGSTEN METAL AND ALLOYS

Electro Metallurgical Co., 30 E. 42nd St., New York City.

TURBINES (Steam)

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

TURBO BLOWERS—See BLOWERS

TURNTABLES

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Atlas Car & Mfg. Co., The, 1100 Ivanhoe Rd., Cleveland, O.

TURRET LATHES—See LATHES (Turret)

TURRET LATHE CUTTERS (Carbide Tipped)

Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TWIST DRILLS

Cleveland Twist Drill Co., The, 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

UNIT HEATERS

American Foundry Equipment Co., The, Mishawaka, Ind.
Dravo Corp., (Machinery Div.) 300 Penn Ave., Pittsburgh, Pa.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

VACUUM CLEANERS

Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

VALVE CONTROL (Motor Operated Units)

Cutler-Hammer, Inc., 1211 St. Paul Ave., Milwaukee, Wis.

VALVE CONTROLS

Hays Corp., The, Michigan City, Ind.
Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa.

VALVES (Blast Furnace)

Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Co., Sharpsburg, Branch, Pittsburgh, Pa.
Freyn Engineering Co., 310 S. Michigan Ave., Chicago, Ill.

VALVES (Blow-off)

Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.

VALVES (Brass, Iron and Steel)

Crane Co., 863 S. Michigan Ave., Chicago, Ill.
Flori Pipe Co., The, 5700 Bulwer Ave., St. Louis, Mo.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Reading, Pa.

VALVES (Butterfly)

R-S Products Corp., 132 Berkley St., Philadelphia, Pa.

VALVES (Check)

Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Reading, Pa.

VALVES (Control—Air and Hydraulic)

Anker-Holth Mfg. Co.—Airgrip Chuck Div., 332 S. Michigan Ave., Chicago, Ill.
Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Galland-Henning Mfg. Co., 2747 S. 31st St., Milwaukee, Wis.
Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.
Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.
Racine Tool & Machine Co., Racine, Wis.

VALVES (Electrically Operated)

Bristol Co., The, 112 Bristol Rd., Waterbury, Conn.
Cutler-Hammer, Inc. 315 N. 12th St., Milwaukee, Wis.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

VALVES (Gas and Air Reversing)

Blaw-Knox Co., Blawnox, Pa.

VALVES (Gate)

Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Crane Co., The, 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Reading, Pa.

VALVES (Globe)

Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Reading, Pa.

VALVES (Hydraulic)

Bayard, M. L., & Co., 20th & Indiana Ave., Philadelphia, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Elmes, Chas. F., Engineering Works, 243 N. Morgan St., Chicago, Ill.
Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Racine Tool & Machine Co., Racine, Wis.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

VALVES (Iron & Steel)

Galland-Henning Mfg. Co., 2747 S. 31st St., Milwaukee, Wis.

VALVES (Needle)

Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Reading, Pa.

VALVES (Plug)

Homestead Valve Mfg. Co., P. O. Box 22, Coraopolis, Pa.

VALVES (Proportioning)

North American Mfg. Co., The, 2910 E. 75th St., Cleveland, O.

VALVES (Steam and Water)

Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Reading, Pa.

VALVES AND FITTINGS—See PIPE FITTINGS

VANADIUM

Electro Metallurgical Co., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

VIADUCTS (Steel)—See BRIDGES, ETC.

VISES (Pneumatic)

Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago, Ill.

WALKWAYS—See FLOORING—(Steel)

WASHERS (Iron and Steel)

Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.
Thompson-Bremer & Co., 1644 W. Hubbard St., Chicago, Ill.

WASHERS (Lock)

Garrett, George K., Co., D & Tioga Sts., Philadelphia, Pa.
National Lock Washer Co., Newark, N. J.
Thompson-Bremer & Co., 1644 W. Hubbard St., Chicago, Ill.

WASHERS (Non-ferrous and Stainless)

Garrett, George K., Co., D & Tioga Sts., Philadelphia, Pa.
Harper, H. M., Co., The, 2646 Fletcher St., Chicago, Ill.
Shenango-Penn Mold Co., Dover, O.

WASHERS (Spring)

Barnes, Wallace, Co., The, Div. Associated Springs Corp., 97 Main St., Bristol, Conn.
Garrett, George K., Co., D & Tioga Sts., Philadelphia, Pa.
National Lock Washer Co., Newark, N. J.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 S. Centre St., Corry, Pa.
Thompson-Bremer & Co., 1644 W. Hubbard St., Chicago, Ill.

WATER COOLERS

General Electric Co., (Air Conditioning & Commercial Refrigeration Dept.) Bloomfield, N. J.

WATER FILTRATION & SOFTENING

Graver Tank & Mfg. Co., Inc., 4809-40 Tod Ave., E. Chicago, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.

WELDED STEEL CONSTRUCTION

Pollock, Wm. B., Co., The, 101 Andrews Ave., Youngstown, O.

WELDERS (Electric—Arc)

General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Hobart Bros., Co., The, Box ST—102, Troy, O.
Lincoln Electric Co., The, Cleveland, O.
Welding Equipment & Supply Co., 220 Leib St., Detroit, Mich.

WELDING

Bartlett-Hayward Div. Koppers Co., Baltimore, Md.
Bayard, M. L., & Co., 20th & Indiana Ave., Philadelphia, Pa.
Eutectic Welding Alloys, Inc., 40 Worth St., New York City.
Lincoln Electric Co., The, Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
Scaife Co., Ann St., Oakmont, Pa.
Western Gas Div., Koppers Co., Ft. Wayne, Ind.

WELDING (Stainless)

Metal & Thermit Corp., 120 Broadway, New York City.

WELDING (Thermit)

Metal & Thermit Corp., 120 Broadway, New York City.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Electric)

Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee, Wis.
Electric Controller & Mfg. Co., The, 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Hobart Bros., Co., The, Box ST—102, Troy, O.
Lincoln Electric Co., The, Cleveland, O.
McKay Co., The, York, Pa.
Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.
National Cylinder Gas Co., 206 W. Wacker Drive, Chicago, Ill.
Welding Equipment & Supply Co., 220 Leib St., Detroit, Mich.
Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.
Wilson Welder & Metals Co., 60 E. 42nd St., New York City.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Oxy-Acetylene)

Air Reduction, 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago, Ill.
Welding Equipment & Supply Co., 220 Leib St., Detroit, Mich.

WELDING DIES (Flash)

Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.

WELDING POSITIONERS

Ransome Concrete Machinery Co., Dunellen, N. J.

WELDING RODS (Alloys) (*Also Stainless)

*Alloy Rods Co., York, Pa.
American Agile Corp., 5806 Hough Ave., Cleveland, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Ampco Metal Inc., 3830 W. Burnham St., Dept. S-10, Milwaukee, Wis.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
International Nickel Co. Inc., The, 67 Wall Street, New York City.
*Lincoln Electric Co., The, Cleveland, O.
*McKay Co., The, York, Pa.
Metal & Thermit Corp., 120 Broadway, New York City.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Welding Equipment & Supply Co., 220 Leib St., Detroit, Mich.

WELDING RODS (Bronze)

American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Welding Equipment & Supply Co., 220 Leib St., Detroit, Mich.

WELDING RODS (Hard Surfacing)

Lincoln Electric Co., The, Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Wall-Colmonoy Corp., 637 Buhl Bldg., Detroit, Mich.

WELDING RODS (Stainless)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Carpenter Steel Co., Reading, Pa.
Lincoln Electric Co., The, Cleveland, O.
McKay Co., The, York, Pa.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.

WELDING RODS OR WIRE

Air Reduction, 60 E. 42nd St., New York City.
American Agile Corp., 5806 Hough Ave., Cleveland, O.
American Brass Co., The, Waterbury, Conn.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Ampco Metal, Inc., Dept. S-10, Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Hobart Bros. Co., The, Box ST—102, Troy, O.
Keystone Steel & Wire Co., Peoria, Ill.
Lincoln Electric Co., The, Cleveland, O.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
McKay Co., The, York, Pa.
Metal & Thermit Corp., 120 Broadway, New York City.
National Cylinder Gas Co., 205 W. Wacker Drive, Chicago, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
Welding Equipment & Supply Co., 220 Leib St., Detroit, Mich.
Wickwire Brothers, 183 Main St., Cortland, N. Y.
Wilson Welder & Metals Co., 60 East 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WELDING TIPS (Spot)

Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.

WELDING WHEELS (Seam)

Mallory, P. R., & Co., 3029 E. Washington Ave., Indianapolis, Ind.

WELL WATER SUPPLY SYSTEMS

Layne & Bowler, Inc., Memphis, Tenn.

WHEELS (Car and Locomotive)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Standard Steel Works Div. of The Baldwin Locomotive Works, Philadelphia, Pa.

WHEELS (Grinding)

Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill.

WHEELS (Track)

National-Erie Corp., Erie, Pa.

WHEELS (Trolley)

Crosby Co., The, 183 Pratt St., Buffalo, N. Y.

WINCHES (Electric)

American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Shepard Niles Crane & Hoist Corp., 358 Schuyler Ave., Montour Falls, N. Y.

WINCHES (Electric, Gasoline, Diesel)

Silent Hoist Winch & Crane Co., 843 63rd St., Brooklyn, N. Y.

WIRE (Alloy Steel) (*Also Stainless)

*Allegheny Ludlum Steel Corp., 2319 Oliver Bldg., (22) Pittsburgh, Pa.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
*Carpenter Steel Co., Reading, Pa.
Columbia Steel Co., San Francisco, Calif.
*Firth-Sterling Steel Co., McKeesport, Pa.
*Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

WIRE (Brass, Bronze or Copper)

Bristol Brass Corp., The, Bristol, Conn.

WIRE (Annealed, Bright, Galvanized)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Worcester, Mass.
Keystone Steel & Wire Co., Dept. AC, Peoria, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wheeling Steel Corp., Wheeling, W. Va.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Barb)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Corp., E. 45th & Broadway, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Cold Drawn)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Johnson Steel & Wire Co., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (High Carbon)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Washburn Wire Co., 118th St. and Harlem River, New York City.

WIRE (Music)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Johnson Steel & Wire Co., Worcester, Mass.
Roebling's, John A., Sons Co., Trenton, N. J.
Washburn Wire Co., 118th St. and Harlem River, New York City.

WIRE (Nickel Silver)

Seymour Manufacturing Co., The, Seymour, Conn.

WIRE (Phosphor Bronze)

Seymour Manufacturing Co., The, Seymour, Conn.

WIRE (Round, Flat, Square, Special Shapes)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Spring)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace, Co., The, Bristol, Conn.
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Keystone Steel & Wire Co., Dept. AC, Peoria, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (Stainless)

Carpenter Steel Co., Reading, Pa.

WIRE (Stapling)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Dept. AC, Peoria, Ill.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.

WIRE (Welding)—See WELDING RODS OR WIRE

WIRE AND CABLE (Electric)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
General Electric Co., Sec. G-2903, Appliance & Merchandise Dept., Bridgeport, Conn.
Graybar Electric Co., 420 Lexington Ave., New York City.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE CLOTH

Cyclone Fence Div., American Steel & Wire Co., Waukegan, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Wickwire Brothers, 189 Main St., Cortland, N. Y.

WIRE COILING TOOLS (Cemented Carbide)

Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

WIRE COVERING MACHINES

Fidelity Machine Co., 3908-18 Frankford Ave., Philadelphia, Pa.

WIRE FORMS, SHAPES AND SPECIALTIES

American Chain Div. American Chain & Cable Co., Inc., York, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace Co., The, Div. Associated Spring Corp., 97 Main St., Bristol, Conn.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Raymond Mfg. Co., Div. Associated Spring Corp., 280 S. Centre St., Corry, Pa.
Raymond Mfg. Co., Div. Associated
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

WIRE FORMING MACHINERY

Nilson, A. H., Machine Co., The, Bridgeport, Conn.

WIRE MILL EQUIPMENT

Fidelity Machine Co., 3908-18 Frankford Ave., Philadelphia, Pa.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

WIRE NAILS—See NAILS

WIRE PRODUCTS

(*Also Stainless)

*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Continental Steel Corp., Kokomo, Ind.
Hubbard, M. D., Spring Co., 444 Central Ave., Pontiac, Mich.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Keystone Steel & Wire Co., Dept. AC Peoria, Ill.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE ROPE AND FITTINGS

American Cable Div. of American Chain & Cable Co., Inc., Wilkes-Barre, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Hazard Wire Rope Div. of American Chain & Cable Co., Inc., Wilkes-Barre, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Macwhyte Co., 2912 14th Ave., Kenosha, Wis.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE ROPE SLINGS

American Cable Div. American Chain & Cable Co., Inc., Wilkes-Barre, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Hazard Wire Rope Div., American Chain & Cable Co., Inc., Wilkes Barre, Pa.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Macwhyte Co., 2912 14th Ave., Kenosha,, Wis.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE SPOOLING MACHINES

Fidelity Machine Co., 3908-18 Frankford Ave., Philadelphia, Pa.

WIRE STRAIGHTENING AND CUTTING MACHINERY

Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh, Pa.
Lewis Machine Co., 3450 E. 76th St., Cleveland, O.
Shuster, F. B., Co., The, New Haven, Conn.

WIRE WINDING MACHINES

Fidelity Machine Co., 3908-18 Frankford Ave., Philadelphia, Pa.

WRENCHES (Drop Forged)

Williams, J. H., & Co., 400 Vulcan St., Buffalo, N. Y.

ZINC

New Jersey Zinc Co., 160 Front St., New York City.

ZINC ALLOYS

New Jersey Zinc Co., 160 Front St., New York City.

ZINC (Rolled Sheets, Strips, Coils)

New Jersey Zinc Co., 160 Front St., New York City.

ZIRCONIUM METAL AND ALLOYS

Electro Metallurgical Co., 30 E. 42nd St., New York City.

PROTECT the Employee and SPEED Production—

For 27 years Bethlehem has been waging war on the most dangerous saboteur of industrial production—accidents. Today, with the future of the nation so dependent upon top-speed production of war steel, we are stepping up the safety and first-aid effort on a widening scale.

First-aid instruction is being given to thousands of employees. Established safety practices are daily being intensified. More safety shoes, goggles, helmets, respirators and fire-proof clothing. More warning signs and flags to mark danger spots. More safety posters to keep workers safety-conscious. . . . No detail is overlooked which can possibly contribute to the fast, efficient, *safe* production of steel for America's ever-growing war needs.

TOE-SAVING SHOES—Each of these five steel-reinforced safety shoes saved a foot from painful injury and kept one more worker on the job, fit, and able to continue doing his share to keep up the flow of Bethlehem's war production.

DANGER SPOT—But it's been rendered harmless by a short railing and a sign. Instead of stepping out blindly from the corner of the building, workers must cross the track at a point where they can hardly fail to notice an approaching train.

REHEARSAL—This team of first-aid men is giving treatment to an accident "victim" at one of Bethlehem's first-aid contests, held annually for many years. Thanks to this training, thousands of Bethlehem-trained first-aiders are constantly on the alert in steel plants and mines to prevent or treat industrial accidents.

SAFETY SCHOOL—By movies and lectures, Bethlehem employees are continuously being trained in the safest, most efficient methods of handling their jobs. Year after year, this education in the safe way to do every job goes steadily forward.

Information PLEASE

Accurate information is an invaluable guide to the selection of equipment.

This heavily illustrated catalog covers the complete line of Cincinnati All-Steel Shears.

- . . . includes data and dimension sheets.
- . . . descriptions of standard and optional equipment.
- . . . completely illustrated details of Cincinnati construction.

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SHAPERS • SHEARS • BRAKES

CINCINNATI, OHIO

McKAY

HEAVY DUTY ROLLER LEVELLER

For Victory!

THE YANKS are coming! The TANKS are coming! It's the alarm that sounds through the Axis ranks when the American Juggernauts roll into the fight.

TANKS—and MORE TANKS—FASTER and FASTER!

AMERICA CAN DO IT and AMERICA WILL DO IT!

Armor plates for tanks require special heavy duty roller levellers — and here's where McKay can help tank manufacturers produce FASTER and FASTER.

McKAY Heavy Duty Roller Levellers, such as illustrated, are specially designed for leveling the various widths and thicknesses of all kinds of plate.

GIVE US YOUR REQUIREMENTS and WE WILL SUBMIT SPECIFICATIONS FOR THE SIZE AND TYPE OF LEVELLER YOU NEED.

McKAY

The McKAY MACHINE Company

ENGINEERS AND MANUFACTURERS OF SHEET, TIN, AND STRIP MILL EQUIPMENT

YOUNGSTOWN, OHIO

ASSOCIATED COMPANY

The WEAN ENGINEERING CO., Inc. • WARREN, OHIO

BEHIND THE SCENES

You may be the cause of the loss of many skilled men by failing to be realistic enough about your training of replacements and about designating the men you really want to hold on to.

—Maj. Gen. Lewis B. Hershey.

Wartime Advertising

■ It seems to us these excerpts from the speech by Carroll L. Wilson, Director of the Bureau of Foreign and Domestic Commerce, before the National Federation of Sales Executives are well worth repeating:

National advertising is another specialized phase of the art of selling. Some people believe that it should be abolished for the duration. I disagree heartily. Today, more than ever before, distributors and consumers alike are confused. Informative advertising can and will help to dispel this confusion.

The educational value of advertising has been greatly underrated by its critics; frequently it has been underrated by advertisers themselves who abuse the confidence consumers would like to place in such advertising. But with new price regulations, rationing, and shortages, the informative value of national advertising is evident. It can be a powerful force for distributor and consumer education.

Climbing Up

■ We're sure you'll be pleased to hear that Wallace G. Imhoff's song hit, "Here Comes America" is steadily working its way up among the hit tunes of this year. Vincent Lopez put it on the air over a national hookup and it is being played more and more at various places over the country.

If you're a piano player, horn blower, or even a mouth organ artist stop in and buy yourself the sheet music. You'll like it.

Another War Song

■ Another new war song originating with the metal industry is by Mrs. Laura Bell Richardson, wife of Russell C. Richardson of the Zanesville division of The American Rolling Mill Co. Mrs. Richardson was winner of the Armco War Song Contest with "Help Defend the U. S. A."

New Blitz Buggies

■ New equipment and new methods to fight tanks are being worked out by the Army in Texas maneuvers with armed and armored vehicles known technically as TD (tank destroyer). Capable of speeds up to 70 m. p. h. the cars travel on multiple wheels—four, six and some with eight. Lightly armored, they are heavily armed with guns arranged to fire in a forward direction only, possessing great advantage over tanks in speed and maneuverability and also over conventional types of towed artillery. An army officer explained the TD tactics as follows:

The idea is to catch your adversary sitting in his corner with his back turned, hit him behind the ear with brass knuckles, then rush full speed to a new position for another sneak punch!

Name, Please

■ What to name a new iron mining town in the Adirondacks is a question. It is being built at a cost of $5,000,000 to house workers for Republic Steel Corp.'s expanding operations in that district, and the development has now reached the stage where officials of the Federal Housing Authority, who have set up offices at nearby Moriah to oversee construction, feel something must be done about a name.

Hence a contest is on. Miss C. Eleanor Hall, Port Henry, N. Y., submitted the first suggestion, "Dabilla", in honor of Major James Dabilla, who more than a century ago established the iron industry in Moriah.

Any other suggestions?

Scrap Solution

■ One of our facetious friends in trying to out-Pegler Pegler suggests the scrap salvaging committees move in on the brass name plates adorning some umpteen million vice presidents' desks and office doors throughout the banks and industrial offices of the country.

That reminds us of the two distinguished looking gentlemen who met in the club car of a crack transcontinental and after the usual opening remarks, and the usual scotch and soda, the one politely asked the other who he was with back in the big city.

"Why, I'm vice president of the Such and Such National Bank," was the reply.

"Say, I'm certainly glad to make your acquaintance", the other gentleman said, "So am I!"

"True" Story

■ This story reaches us through at least four hands so it may be slightly colored by now, but nevertheless it has developed into a good tale.

It seems that one of the WPB heads was complaining that things weren't going too well, and as an example he cited the trouble they were having with the machine tool industry. For example, he explained, there is one large milling machine manufacturer who hasn't had a report in for at least six months.

The listener agreed that was bad and suggested they check through right away and see what was wrong, and so they went on down the line to the clerk who would ordinarily get the reports.

"Haven't we had *any* report in from the So-and-So Milling Machine Co.?", they asked.

"Oh yes, sir," came the answer, "they've been coming in regularly every month and I've sent them right on over to the Department of Agriculture."

"Why?", came the groan.

"Well, milling machines would fit in there better, wouldn't they, sir?"

And to drag the story on, the Department of Agriculture said certainly they'd been getting them, couldn't figure out what they were all about, and you will find them piled up over there on the other side of the room.

Vol. 111, No. 14, October 5, 1942, issue of STEEL, published every Monday at Cleveland, O. Entered as second class matter at the post office, Cleveland, O., under act of March 3, 1879. U. S. and possessions, Canada, Mexico, Cuba, Central and South America, 1 year $6; 2 years $10; all other countries, 1 year $12. Current issues, 25c. Yearbook of Industry issue, $2.00.

Editorial Contents—Page 89

It is later (and worse) than you think!

Wishful thinking is an American habit. Another name for it is "kidding ourselves." Ordinarily it isn't serious. But this time it can cost us our lives.

"This country has never been beaten in all its 166 years."

Japan has never been beaten in its 2000 years.

"They can't get at us, 3000 miles away."

Japan got to Burma 3600 miles away—and conquered it.

"Anyway, we're pouring it out of our factories."

But Germany has been doing just that for 10 years—and at a faster rate per man than we have yet reached.

"Our boys are brave."

You bet they are. But they're up against fanatics, who are experienced campaigners.

"Our Allies will hold until we get there."

Singapore, Philippines, Pearl Harbor, Burma—and now Libya.

"The Government is handling the war."

Who IS the Government except YOU? And if YOU don't do YOUR part, don't blame "the Government" when you slave for Jap and German masters at starvation wages with NO rights and NO liberties.

"But I can't give up my rights."

NO? Our soldiers have. Most managers have. Almost all owners have. And unless EVERYONE gives up EVERY "right" that slows war production, the Jap and German will TAKE your rights—every one of them—FOREVER.

"Anyway, what can one man do?"

What if all the other 130,000,000 Americans felt the same? If you do, they have a right to. And too many do. Nobody else is going to win this war for you. YOU win it—or YOU lose it. And if you lose it, you and your family will pay for it in agony and starvation the rest of your lives. Ask the Poles, the Czechs, the French.

WARNER & SWASEY
Turret Lathes
Cleveland

And this war is nearer to being lost than you think. That isn't pessimism—it's only looking the facts in the face. *Work* by *you* can save it. But—*there isn't much time to get busy.*

SIX Versatile

Versatility in quick adaptability to varying job requirements is one wartime advantage of the six Oster machines illustrated.

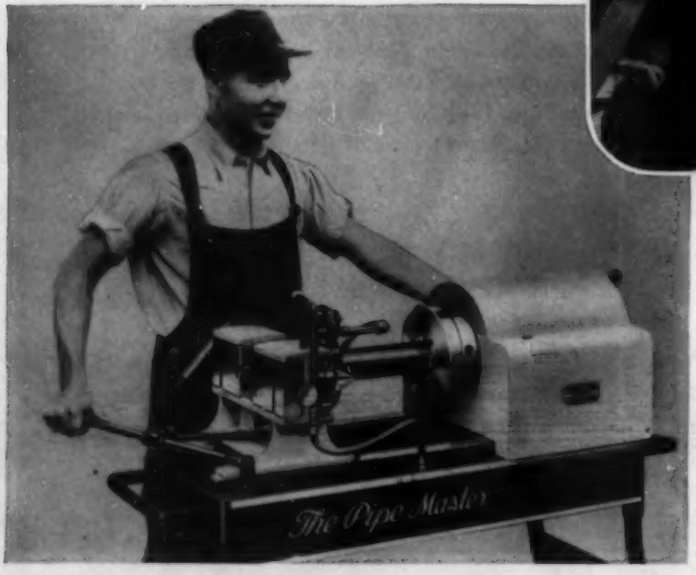
Another timely advantage of all six machines is their *simplicity* of design and operation. Rapid training of new workers is a resultant advantage.

Four of these Oster machines are *portable* pipe and bolt threaders. Each has its specific scope of advantages. Another machine is the Oster Power Vise Stand designed for use with your present hand pipe threaders, reamers, and cutters.

Oster No. 422 Power Vise Stand. Puts *power* in your present hand die-stocks, reamers, and cutters. Note this example of TIME SAVED over the hand method:

5 minutes-27 seconds SAVED threading 2" pipe. Other sizes threaded at comparable time savings.

OSTER



It takes only 38 seconds to thread 1" pipe, and only 45 seconds to thread 2" pipe on the Oster No. 414 "Power Boy." Other sizes in range of this machine show comparable speeds. The "Power Boy" is designed for use with the larger sizes of hand pipe tools. Also threads bolts from ½" to 1½" N. C. or Whitworth.

The Oster No. 502 "Pipe Master" is a complete, portable pipe and bolt threading machine which provides time saving advantages like these: 1" pipe cut off, reamed, and threaded in 3 minutes-41 seconds LESS time compared with hand method; 6 minutes-18 seconds saved on floor to floor operations on 2" pipe. This machine also threads bolts at high speeds.

TIME SAVERS!

The sixth machine in the group is the Oster No. 601 "RAPIDUCTION" Lathe, a power driven screw machine with manually operated, 6 position turret, or with plain saddle, as desired. Two types of drive are optional, DIRECT drive for high speed work on small diameters and non-ferrous metals; and WORM drive for transmitting a smooth flow of power for such work as making deep forming cuts with absence of chatter.

If interested in one or more of these modern machines, communicate with . . .

THE OSTER MANUFACTURING COMPANY
2037 EAST 61st STREET • CLEVELAND, OHIO, U. S. A.

The Oster No. 562 "Tom Thumb" Portable Pipe and Bolt Threading Machine (illustrated at right) chucks, threads, reams and chamfers, and cuts off 1" pipe in 46 seconds; 2" pipe in 1 minute-11 seconds. Comparable speeds on other sizes within range of machine.

OSTER

SIMPLICITY of design and operation is one big advantage of the Oster No. 601 "RAPIDUCTION" Lathe (illustrated above). Equipped with six-position, manually operated turret, this modern, motor-driven screw machine performs a wide range of bar and chucking operations. New workers, men or women, are trained rapidly on the Oster No. 601 "RAPIDUCTION" Lathe.

VERSATILITY in standard and unusual types of threading makes the Oster No. 531 "Tom Thumb" a wartime necessity in many plants. On all operations from floor to floor, No. 531 consistently chalks up speeds like these: 26 seconds on 1" bolts; 19 seconds on 1" pipe.

Will they lose battles FOR LACK OF STEEL?

We *could* lose crucial second-front battles . . . see needless thousands of our soldiers sacrificed . . . even lose the war. But we *must not.*

We'll shorten the war by giving our fighting men all the steel equipment they need. It's not solely up to the workers in war plants. It's up to all of us, because scrap iron is desperately needed to make steel that goes into this fighting equipment.

Here Are the Figures: Our steel industry produced 67 million tons in 1940—broke all records by producing 83 million tons in 1941. *Yet we need still more.* This year the steel industry *can* produce 90 million tons if you and other Americans will gather up and turn in six million *additional* tons of scrap.

Why Scrap Is Needed: New steel is made from scrap iron and pig iron (about half and half). Because the scrap has already been refined it cuts down priceless production time.

What Can *You* Do? Be sure your plant has salvage committees with an energetic chairman for every department. Let them gather all the scrap iron they can find and call the scrap dealer. He'll hurry it off to the steel mills to help win these life-or-death battles. All scrap collected will be purchased by the steel industry at government-controlled prices.

Back up our fighting men. The least we can do for them (perhaps sons or brothers) is give them the fighting equipment they must have to win. Your scrap will help. Get it in—fast! The American Rolling Mill Company, 3031 Curtis Street, Middletown, Ohio.

ARMCO

TURN IN ALL YOUR SCRAP

metal shows that play to encores....

A fortnight on the board and tacks are lifted . . . keen checkers scrutinize for error while prints dry . . . Pattern craftsmen confer with molding artisans and the stage is set for production . . . Powerful illumination brightens partly finished steel as lathes and grinders, manned by a night shift, cope with the workers of the day in speeding machined parts for assembly . . . Long benches and rows of sensitive-fingered women match micrometered pieces to be actuated by shiny coils of spring steel—that when attached, complete the unit . . . Inspectors linger while mechanisms turn—and design sets itself in motion . . . A machine has been born and approved—engineers, mind at ease, return to their boards—another task to tackle.

And now for the *commercial*. It's the type of "metal-drama" one encounters in most every plant today—a huge build-up with careful cast selection to insure a *road-show* of *encores*. That's why the specification of so simple a thing as a spring should be made with the utmost discretion. SCIENTECH Spring Service by Lee is a development that scientifically pre-determines the exact spring product best suited to your need—and, of course, we'd like to follow thru with the Lee product.

LEE SPRING COMPANY, INC.
30 MAIN STREET BROOKLYN, N. Y.

We are indebted to HIG of Phoenix Flame who originally shot this remarkable photo

Dig Up Every Scrap of BRASS

THE ARMED FORCES NEED IT NOW

GOOD brass scrap helps to make *new* brass faster. . . . It will help to catch up more rapidly with the crying need for munitions to supply millions of United Nations fighting men who are not supplied sufficiently, now, to give them an equal fighting chance against the accumulated supplies of the enemy.

This brass scrap must be had . . . for it is urgently needed on jobs that only brass can do.

In and around every industrial plant (and around home, too), a little systematic and intensive "bird-dogging" will turn up some scrap brass. *No amount is too small* . . . it will certainly be enough to fire a shot that may decide a battle on land, at sea, or in the air.

So have a "Brass Finders Committee" organized today. And when you have a fair-sized accumulation . . . *don't wait.* Call your local scrap dealer or industrial salvage organization. They'll do the rest.

Remember, brass scrap is *always* needed. Keep it coming — to "keep 'em firing." And remember, also, to buy war bonds . . . which buy bullets.

Bristol Brass

THE BRISTOL BRASS CORPORATION • BRISTOL, CONN.

Makers of Brass Since 1850

PUBLISHED IN COOPERATION WITH THE NATIONAL SCRAP METAL COLLECTION DRIVE

BLOCK STRIPPING CRANES and CARRIERS SPEED PRODUCTION

FOR INTERNAL OR EXTERNAL BLOCK STRIPPING

Cleveland Tramrail block stripping cranes and carriers make possible the drawing of heavier bundles and permits a man to take care of more blocks. With this equipment older experienced men can usually keep pace with younger men. Hernia injuries from heavy lifting are eliminated.

The cranes or carriers are easily propelled by hand by means of a rigid arm. At the lower end of the arm is a push button station for convenient operation of the electric hoist. If desired, the hoist may be mounted on a turn-table for ready service to blocks on two sides of an aisle.

Cleveland Tramrail equipment is available for internal stripping, as well as for external stripping of old style non-slotted blocks.

Equipment for block stripping is only one of many items Cleveland Tramrail has developed for the Wire and Wire Products Industry.

BOOKLET No. 2008 . . Packed with valuable information. Profusely illustrated. Write for free copy on your company letterhead.

GET THIS BOOK!

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1125 EAST 283rd ST. WICKLIFFE, OHIO.

MANUFACTURERS OF • CLEVELAND CRANES • CLEVELAND TRAMRAIL • STEEL • D BENDING PRESSES

CLEVELAND TRAMRAIL

OVERHEAD MATERIALS HANDLING EQUIPMENT

MUSIC WIRE

BY

WASHBURN

Washburn wire makers are skilled craftsmen who have been schooled by long experience in the highest standards of quality workmanship. Talent and the most up-to-date equipment produce clean, uniform wire . . . straight throughout the coil, and held to close tolerances in all physical requirements.

The operations of making Eagle Music Wire are exercised with extreme care. To maintain a bright, clean surface, the finished wire is handled with gloves to prevent perspiration marks which lead to rust and finally to surface pitting.

Specify Eagle Music Wire for superlative quality.

WASHBURN WIRE COMPANY, NEW YORK CITY

WASHBURN

CLEAN UNIFORM BILLETS - STRIP - RECTANGULAR, ROUND, FLAT RODS
TEMPERED AND UNTEMPERED FLAT AND ROUND HIGH CARBON WIRES

OUR scope: Fabricated Piping...for steam, water, air, oil, gas, chemicals

Random mill lengths or bent, coiled, welded, flanged, threaded...Valves, Pipe Fittings.

In brief: anything in tubular or plate steel fabrication.

Our present customers: United States of America and Allied Nations. Our postwar customers: You!...we hope.

FLORI PIPING

THE FLORI PIPE COMPANY • ST. LOUIS, MO.

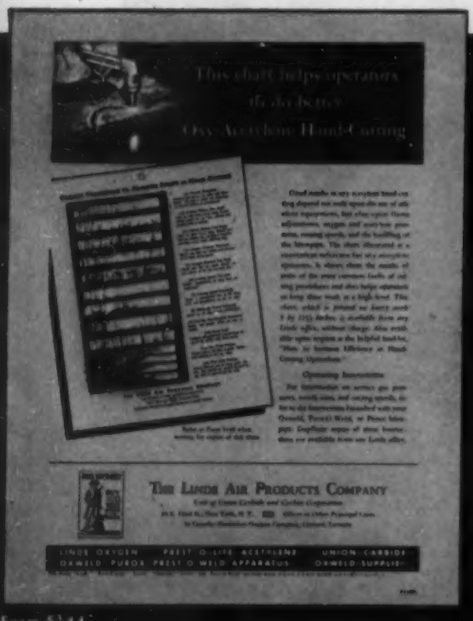
WATCH FOR THESE LINDE ADVERTISING PAGES!

Linde advertisements of the type shown here have for months been appearing, and will continue to appear, in many industrial publications. They are intended to help users of the oxy-acetylene process to get better results in war production . . . to avoid waste . . . and to make oxy-acetylene apparatus and supplies last longer.

Watch for these Linde advertising pages—and when you see one that offers something that will be useful in your operations, you may obtain any quantity of the reprints, charts, or posters that the advertisement illustrates, by writing any Linde sales office.

PROCESS EFFICIENCY

This series of advertisements describes wall charts and other data available to help operators do better work. If you want copies of any of the data shown, order by the indicated form numbers.



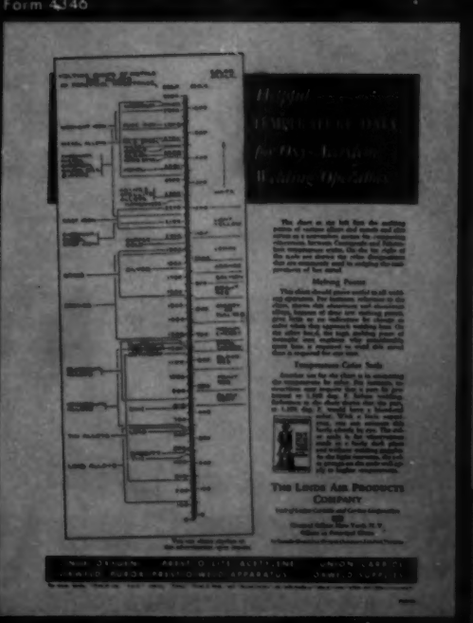
Form 5144

For better results in Oxy-Acetylene Machine Cutting Operations Send for this Descriptive Chart
THE LINDE AIR PRODUCTS COMPANY

Form 4346

Form 5067

Form 4666



Form 4600

Cylinder Conservation

Shown at the right are four of a series of posters that are available to remind your employees of the necessity for returning empty cylinders promptly. When ordering, specify the Form numbers indicated.

Instruction Literature Available

Duplicate copies of the instruction booklet with Oxweld, Prest-O-Weld, and Purox apparatus are available without charge from Linde offices.

APPARATUS AND SUPPLIES CONSERVATION

This series of advertisements contains information that will help to conserve oxy-acetylene apparatus and supplies. Reprints are available upon request. Order by the P-numbers shown.

P. 11878

P. 12810

P. 13494

P. 13419

P. 12812

P. 13611

Form 5104

Form 5137

Form 5107

Form 5135

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
30 E. 42nd St., New York, N. Y. Offices in Other Principal Cities
In Canada: Dominion Oxygen Company, Limited, Toronto

whitcomb locomotives

Coupling High Efficiency.....

with Greater Economy!

After spending 35 years in the business of manufacturing industrial mobile power units, we are in a good position to pause and look at our product objectively. The WHITCOMB locomotive of today is the result of planning, designing and correction; it is the natural consequence of patient endeavor. It is as efficient as human skill can make it, and because it is so efficient and well built, it is as economical as it is useful. The WHITCOMB industrial locomotive performs under the most trying conditions; it is always ready, and fully qualified to settle with performance any question concerning its durability, utility, low maintenance cost and dependable operation. As manufacturers and designers, we are pleased with our mobile power units; users share our opinion. When we have a good thing, we like to talk about it; we'd be glad to tell you more on request.

DIESEL or GASOLINE POWER

MECHANICAL, HYDRAULIC, or ELECTRIC DRIVE

THE BALDWIN GROUP

THE WHITCOMB LOCOMOTIVE CO.

ROCHELLE, ILL.

Subsidiary of THE BALDWIN LOCOMOTIVE WORKS

MOTOR CONTROLS
for every kind of machine

Complex or Simple

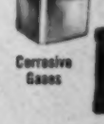
General Purpose

Corrosion Proof

Water Tight

Non-Haz. Dusts

Non-Cor. Gases


Corrosive Gases

Hazardous Dusts

Wall Mounting

Pedestal Mounting

Complete Panels

Reversing

Automatic

Manual

Combination

Multispeed

Relay

9 Types of Enclosures

The surest way to get long, trouble-free starter operation is to select the correct type of enclosure for each installation condition. The A-B line has an enclosure for every type of service.

Complete Panels

When motorized machines require inter-connected control, a multiple unit panel is the logical answer. Let A-B engineers work out your special control requirements with standard A-B controls.

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL FOR ALL INDUSTRIES

QUALITY

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

ALLEN-BRADLEY RELAYS for WAR SERVICE

HERE is a line of exceptionally rugged solenoid relays, designed for war service on aircraft, boats, tanks, etc., that meets Army Air Corps specifications. All relays withstand 10G acceleration, operate in any position, and have dust-tight contact covers.

CONTACTS are special Allen-Bradley cadmium silver alloy. High contact pressure positively prevents chatter under Air Corps vibration test. Terminal blocks and contact covers are of macerated canvas bakelite . . . coils are protected with thermo-plastic varnish.

RATINGS—50, 100, and 200 amperes, 24 volts, single or double pole. All current ratings are good for elevations up to 50,000 feet. Available also as reversing switches and in special panel arrangements.

Allen-Bradley Company
1320 S. Second St., Milwaukee, Wis.

A-B

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

What Zirconium Does For Steel...

AMONG the many "Electromet" ferro-alloys are a number of special deoxidizers. Each has particular value for certain war production jobs. One of the most powerful is Zirconium. Not only does it effectively remove oxygen, but it also reacts with nitrogen and sulphur producing a fine-grained steel free from harmful inclusions. Alloying quantities of Zirconium (up to 0.15 per cent) are essential in the balanced composition of certain of the low-alloy, high-tensile engineering steels. In tool steels it is reported that Zirconium improves the hot-working properties, improves the surface, reduces notch sensitivity, and lessens tendencies toward cracking during heat treatment. It increases the impact values of high-phosphorus Bessemer steels and gives better hot-working properties in free-machining high-sulphur steels. Zirconium is also used for reducing porosity in green-sand castings and for reducing age-hardening in deep-drawing steels.

For most effective results Zirconium is added in combination with silicon. We make two Zirconium alloys . . . one containing 12 to 14 per cent Zirconium and 39 to 43 per cent silicon; the other, 35 to 40 per cent Zirconium with 47 to 52 per cent silicon. If these Zirconium alloys can help in your war production job, one of our metallurgists will be glad to call and discuss them with you.

ELECTRO METALLURGICAL COMPANY

Unit of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York, N.Y.

Items of Interest about other "Electromet" Ferro-Alloys

•

For Cleaner Steel, Make a Final Addition of Calcium-Manganese-Silicon – Calcium-manganese-silicon, used as a final alloy addition to steel, produces a cleaner, coarse-grained steel with deep-hardening properties. Long commercial use of this combination alloy has proved its merits for this purpose. Calcium-manganese-silicon is also being successfully used to deoxidize all types of stainless steel, high-speed tool steels, and special steels subject to transverse testing.

Columbium Improves 4 to 6 Per Cent Chromium Steels – When wrought 4 to 6 per cent chromium steels contain a small amount of columbium, they do not air-harden, and are more ductile even in the as-rolled state. They have higher creep strength, toughness and oxidation resistance at high temperatures. Welding and cutting are facilitated, and subsequent annealing is unnecessary.

Medium-Carbon Ferromanganese Simplifies Production of Low-Carbon Steel – When medium-carbon ferromanganese is used in the production of steel, it is

not necessary to reduce the carbon in the molten metal to the extent required when higher-carbon grades are used. Oxidation of the bath is, therefore, much less severe. Valuable minutes of furnace time are saved. Refractory costs are reduced. Furnace output and yield are raised.

Low-Carbon Ferrochrome Produces Better Chromium Steel – The lower carbon content of low-carbon ferrochrome as compared with high-carbon ferrochrome inhibits the formation and segregation of hard chromium carbide areas in chromium steel. A better, more uniform steel results.

• • •

Write for This Booklet – If you want more information about these and the many other "Electromet" ferro-alloys and metals, their use, and the service that goes with their purchase, write for this 24-page booklet entitled "Electromet Products and Service."

Electromet

Trade-Mark

Ferro-Alloys & Metals

Distributed through offices of Electro Metallurgical Sales Corporation in Birmingham, Chicago, Cleveland, Detroit, New York, Pittsburgh, and San Francisco. In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

The word "Electromet" is a registered trade-mark of Electro Metallurgical Company.

MALLORY STANDARDIZED WELDING ELECTRODES

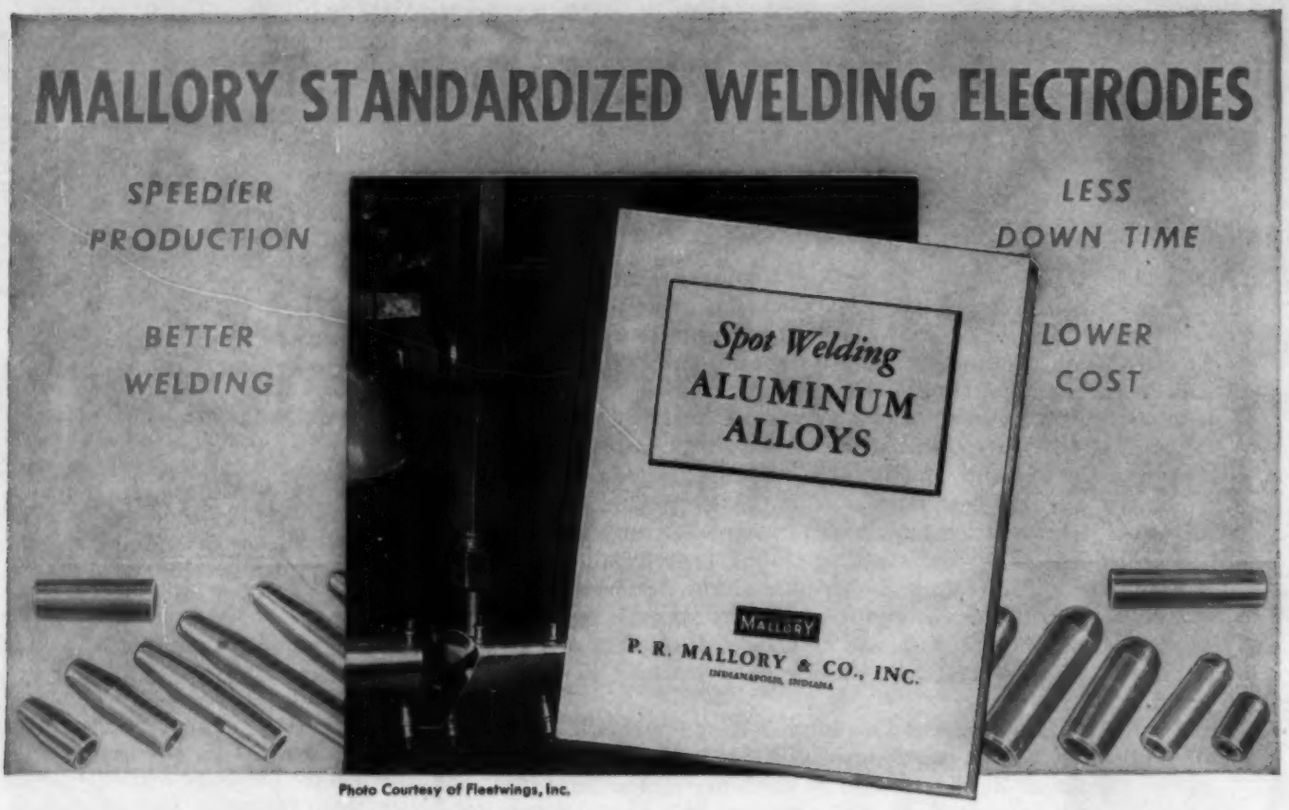


Photo Courtesy of Fleetwings, Inc.

For Welding Engineers with a Future!

This 12-page booklet, "Spot Welding Aluminum Alloys", has a place at the elbow of every design or production engineer who has an eye to the future.

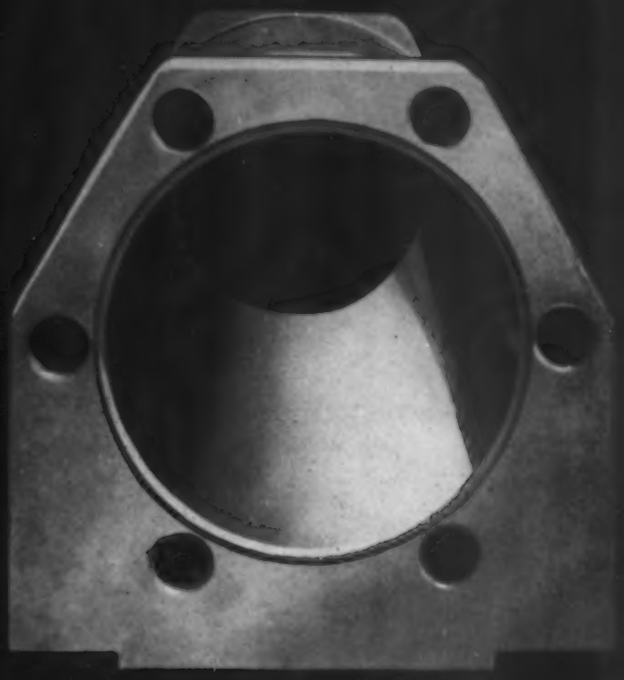
It is a carefully diagrammed treatise, offering in compact form the essential data on:

- Spot welding characteristics of aluminum and its alloys . . . with comparative values for other metals. Tabular data and discussion.
- Spot welding equipment for aluminum alloys. Diagrams and descriptive data on
  - **a. Welding Machines**
    1. Magnetic Storage Welders
    2. Condenser Storage Welders
    3. Rectified Three Phase Welder
    4. Standard A. C. Welders
  - **b. Electrodes**
    1. Materials
    2. Design
    3. Electrode Holders and Cooling
- Design of spot welded joints. Diagrams, tabular data, graphs and discussion.
- Aluminum welding technique. Graphs, tables and discussion relative to the four types of welding machines listed above.

Take a minute now to write for your free copy of "Spot Welding Aluminum Alloys." It belongs on your bookshelf, along with that complete reference, the 79-page Mallory Resistance Welding Data Book.

P. R. MALLORY & CO., Inc., INDIANAPOLIS, INDIANA • Cable Address—PELMALLO

RESISTANCE WELDING P.R. MALLORY & CO. Inc. **MALLORY** **STANDARDIZED ELECTRODES**



We Manufacture to Specifications the following Hollow Bored Parts:

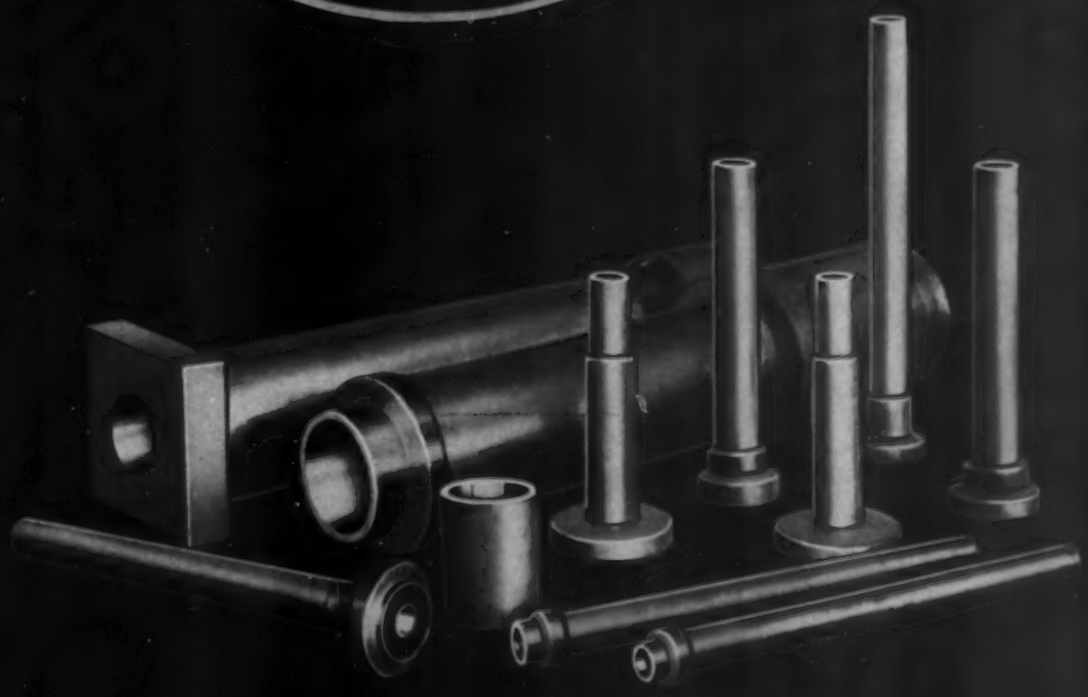
SPINDLES • SPINDLE SLEEVES
HYDRAULIC CYLINDERS • CLUTCH
SHAFTS • CAM SHAFTS • QUILLS
PISTON RODS • RAMS • PINION
GEARS • CENTER PINS AND DRILL
COLLARS FOR OIL WELL
EQUIPMENT MANUFACTURERS

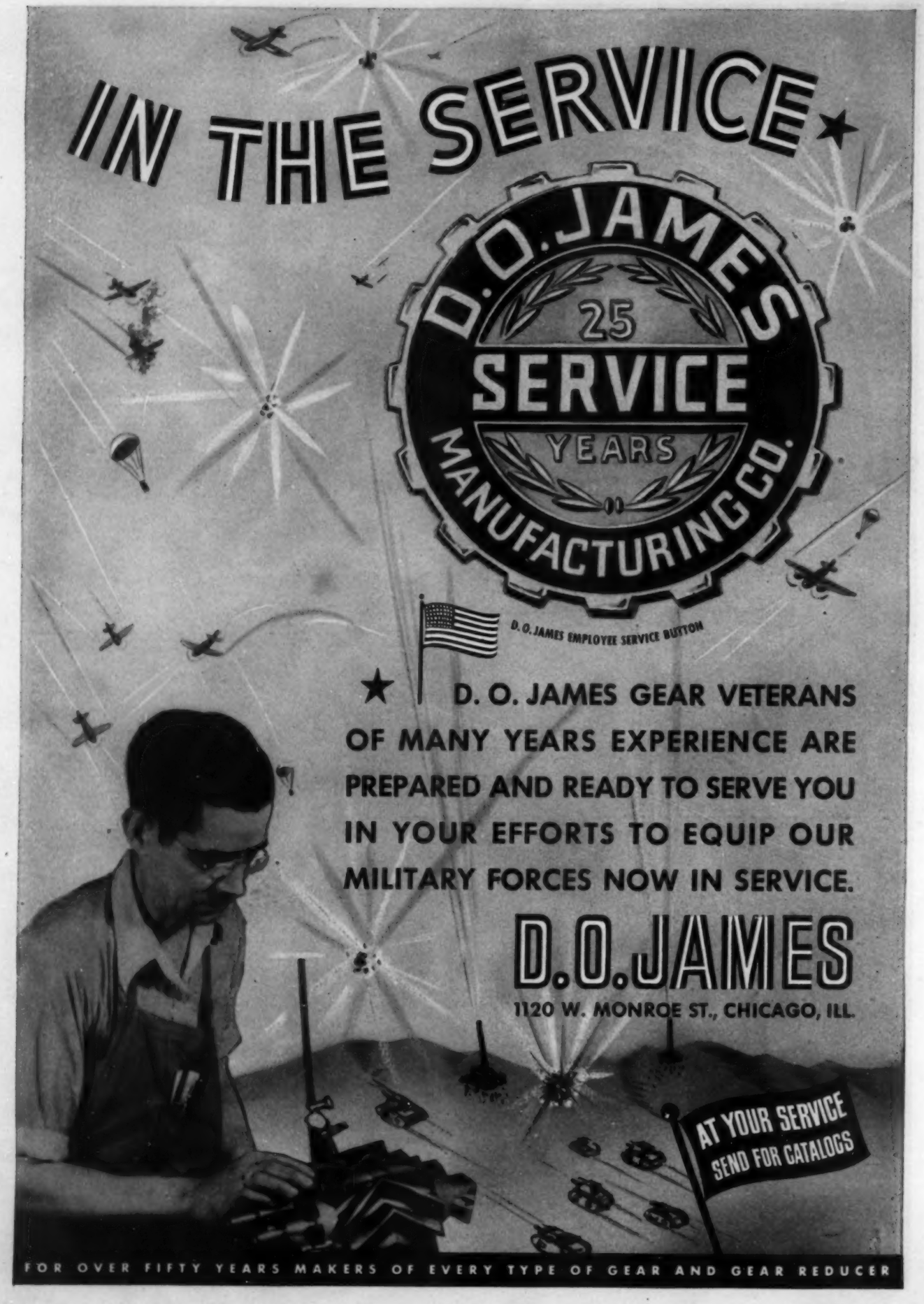
AMERICAN HOLLOW BORING CO.

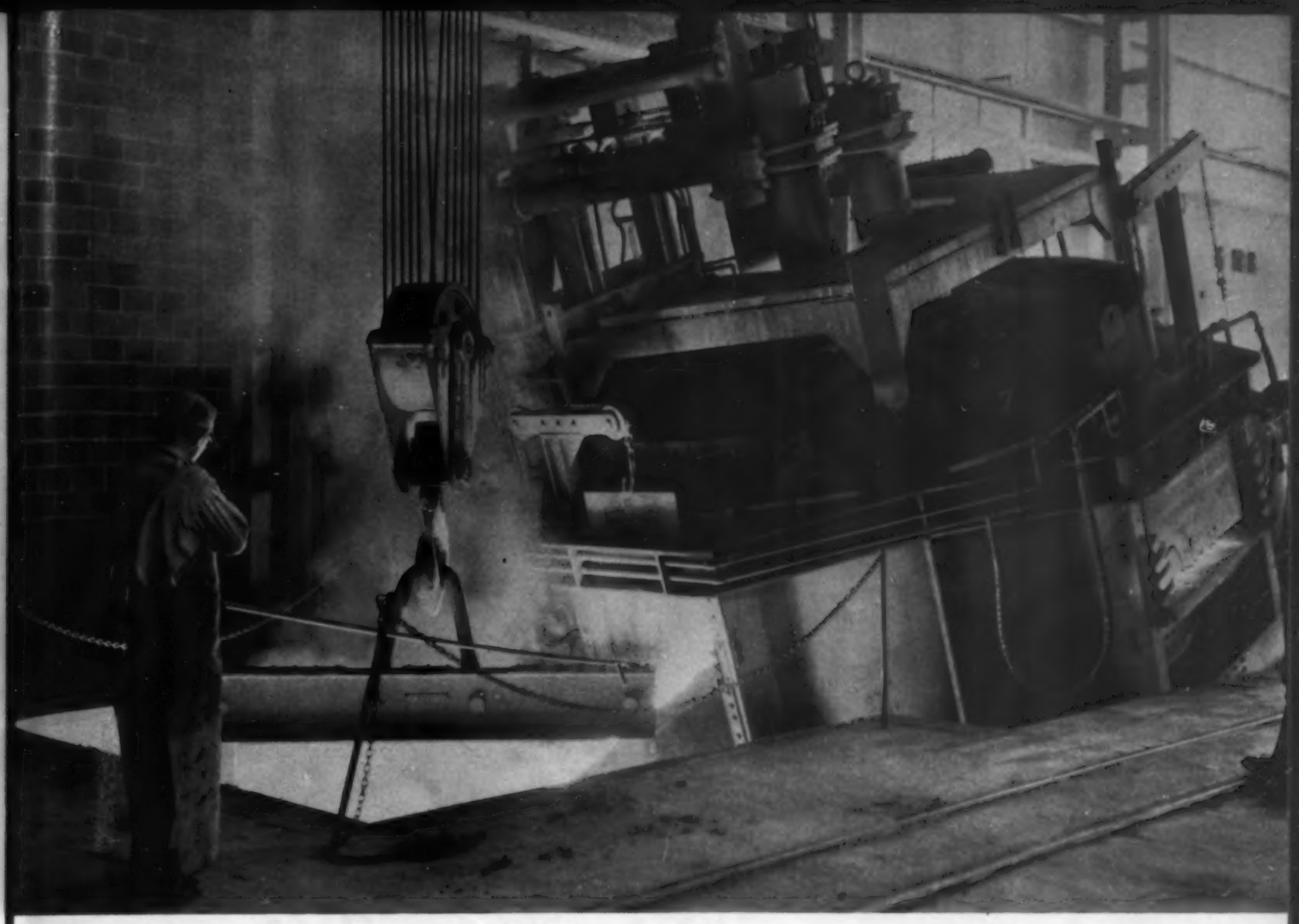
ERIE, PENNSYLVANIA

U. S. A.

Printed in U. S. A.




IN THE SERVICE
D.O.JAMES
25
SERVICE
YEARS
MANUFACTURING CO.
D. O. JAMES EMPLOYEE SERVICE BUTTON
D. O. JAMES GEAR VETERANS OF MANY YEARS EXPERIENCE ARE PREPARED AND READY TO SERVE YOU IN YOUR EFFORTS TO EQUIP OUR MILITARY FORCES NOW IN SERVICE.
D.O.JAMES
1120 W. MONROE ST., CHICAGO, ILL.
AT YOUR SERVICE
SEND FOR CATALOGS
FOR OVER FIFTY YEARS MAKERS OF EVERY TYPE OF GEAR AND GEAR REDUCER



Heroult Electric Furnaces are part of the big push for MORE WAR STEELS

UTMOST production of high-grade alloy steels is essential to our country's success in this war of machines. To keep ships, tanks, planes, and guns moving to far-flung fronts in sufficient quantities calls for top performance by the men and equipment in America's metal producing industries. Heroult furnaces are doing their part in this critical war job, augmenting the flow of war materials which must keep pace with the production of fighting equipment.

All our available resources have been mustered to speed the construction of this highly efficient melting and refining tool. New Heroult furnaces are going into operation continually, taking their places beside veterans, many with service records up to 30 years. Their capacities range from 1 to 100 tons, and production records demonstrate their superiority in the field.

AMERICAN BRIDGE COMPANY

General Offices, Frick Building, Pittsburgh, Pa.

Baltimore · Boston · Chicago · Cincinnati · Cleveland · Denver · Detroit · Duluth
Minneapolis · New York · Philadelphia · St. Louis

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

UNITED STATES STEEL

Stainless Steel

CONSERVE STAINLESS STEEL
Process and Chemical Equipment
IT'S EASY * * * HERE'S HOW
Republic ENDURO Stainless Steel is the nearest approach to the perfect metal for equipment of many kinds in many industries. It withstands corrosive attack and wear far better than most other metals. However, proper care requires only a little time. Give your stainless steel equipment regular, systematic care and you will be repaid in maximum service life.
Follow These Suggestions for Longer Service Life...
1 Cleanliness is of utmost importance. This cannot be stressed too strongly. See section on "How to Clean ENDURO" below.
2 Remove materials and deposits that tend to adhere to the surface of the stainless steel, especially in crevices and corners. It may be impossible to do this while the equipment is in operation. In that case it should be done as soon as the equipment is idle. If at all possible, sweeten or neutralize any sour or acid solutions.
3 Use same types of metals together where possible. Work for uniformity in regard to solutions, temperatures, agitation, concentrations and surface conditions. This will help avoid galvanic cell corrosion possibilities. Such uniformity frequently is impossible to attain and a certain amount of corrosion must then be expected. This corrosion, however, may be greatly retarded by careful cleaning and by periodic restoration of surface passivity of the metal by simply exposing parts to clean air.
4 Avoid prolonged standing of chlorides, bromides, thiocyanates and iodides in stainless steel equipment, especially if acid conditions exist. The pitting action of these compounds may be retarded or avoided by making solutions alkaline. If this is not possible, avoid long contact of compounds with the metal and clean frequently.
5 Be sure the chemicals you employ are recommended for use with stainless steel. Republic Steel Corporation has published a list of foods, chemicals and acids, showing their effect upon stainless steel. If you do not have a copy, write for one.
6 Avoid corrosion fatigue. This is usually the result of a combination of cyclic stresses and mild corrodents. The remedy is to make the equipment sufficiently strong to withstand any stresses which may be encountered. If this is not possible, the equipment or unit should be so constructed as to permit freedom of movement of the entire unit.
* HOW TO CLEAN ENDURO STAINLESS STEEL EQUIPMENT *
Cleansers and Their Reactions to Stainless Steel
Individual cards are available for the following types of equipment:
PROCESS AND CHEMICAL
PULP AND PAPER
FOOD AND BEVERAGE PROCESSING
FOOD HANDLING AND SERVING
TEXTILE
DAIRY

REPUBLIC *Enduro*

Other Republic products include Steel and rust-resisting Toncan* Iron Pipe, Sheets and Roofing—Upson Bolts,

is SCARCE!

Simple care will add years of life to your equipment...

THESE CARDS WILL TELL YOU HOW!

There's nothing better than stainless steel for certain classes of service. Years of performance have proved *that*—have demonstrated its exceptional resistance to rust and corrosion, to wear, to rough use. The high quality of even the most sensitive products processed in stainless steel equipment attests to its inertness and freedom from contamination. Production costs reveal its ease of cleaning —low maintenance costs, its long service life.

So—if you have stainless steel equipment, you're lucky—because YOU PROBABLY CANNOT REPLACE IT TODAY, unless you can qualify for an *exceptionally high* priority.

And it is of the *UTMOST IMPORTANCE* that you take *every* precaution in the use and cleaning of your stainless steel equipment to *extend* its normally long term of useful service to the greatest possible limit. A little care will add years to its life.

Republic's Stainless Steel Conservation Cards will help you give it that care.

From laboratory and performance reports covering more than two decades of experience with ENDURO* Stainless Steel, Republic metallurgists have prepared a simple, but complete, list of precautions and suggestions which may help you get years more service from your stainless steel equipment.

This valuable information has been printed on easy-to-read wall cards which may be posted in your plant. Individual cards give specific data for (1) Textile, (2) Pulp and Paper, (3) Process and Chemical Equipment, (4) Food and Beverage Processing—meat packing, canning, etc., (5) Food Handling and Serving—restaurant, hotel, hospital and institutional kitchen and service equipment, and (6) Dairy and Milk Processing Equipment.

Fabricators of ENDURO equipment have been supplied with these cards for distribution to their customers. If you haven't received one, ask your fabricator. Or, if you will write us direct and tell us the nature of your operations, we shall be glad to send you one (or several, if your plant is large) direct.

REPUBLIC STEEL CORPORATION
Department S
Alloy Steel Division Sales Offices: Massillon, Ohio • General Offices: Cleveland, Ohio
Berger Manufacturing Division • Culvert Division
Niles Steel Products Division • Steel and Tubes Division
Union Drawn Steel Division • Truscon Steel Company
Export Department: Chrysler Building, New York, New York

• • •

TO ENDURO FABRICATORS: *Tell us how many cards you need for your customers and we shall be glad to send them imprinted with your name and address.*

*Reg. U. S. Pat. Off.

REPUBLIC STEEL
PRODUCTION FOR VICTORY

STAINLESS STEEL

Nuts and Rivets—Electrunite* Condenser and Heat Exchanger Tubes—Berger Lockers and Shelving

National Acme CENTRIFUGE SAVINGS

FIT INTO YOUR WAR PRODUCTION PICTURE, TOO!

Centrifuge savings are applied to small shops like this and to hundreds of machines of all kinds employing thousands of gallons of coolants.

Machines take their worst beating when allowed to run with coolants and lubricants containing accumulated grit and other contamination. Merely separating chips and returning the coolant plus make-up is both unsafe and costly.

Clarification with a National Acme precision built centrifuge removes all the finely divided gritty materials, and tangible savings in any shop are these —

You grind and replace cutting tools less frequently.

A higher percentage of your product passes inspection.

Machine bearings and other operating parts show much slower deterioration.

You materially reduce both the quantities and costs of coolants and lubricants.

Our centrifuge engineers will freely show you the application best suited to your shop. *Complete Catalog, P-41.*

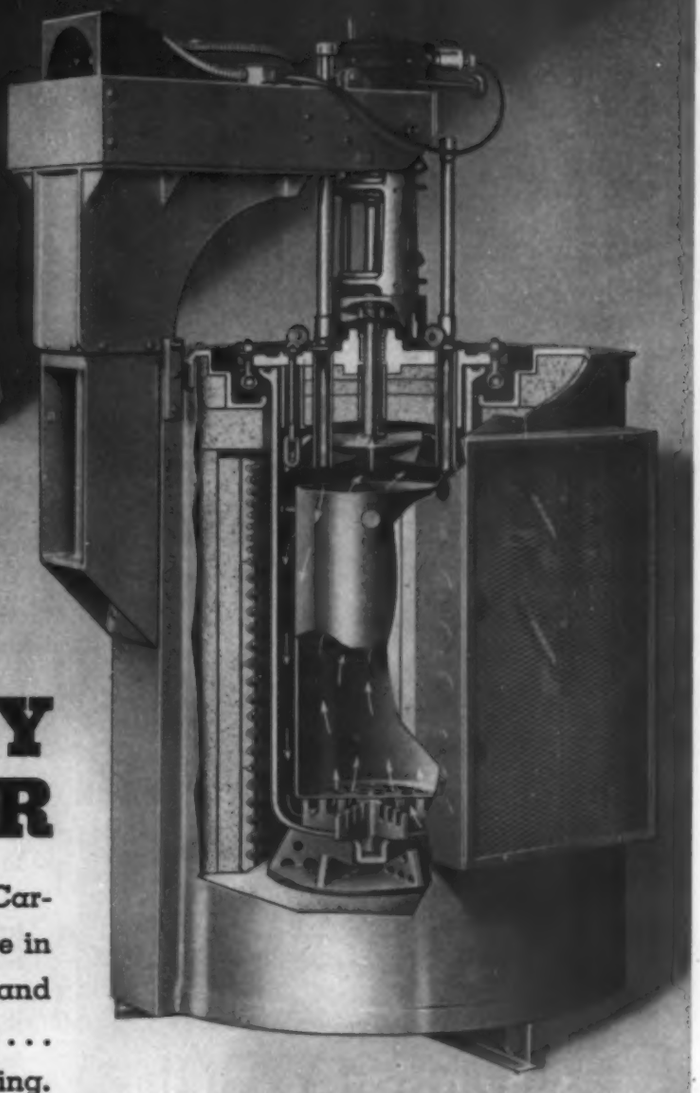
Destructive grit removed from coolant used one day.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • SCREW MACHINE PRODUCTS • THE CHRONOLOG • LIMIT SWITCHES • SOLENOIDS • POSITIVE CENTRIFUGE • CONTRACT MANUFACTURING

THE "INSIDE" STORY



of the HEVI DUTY CARBURIZER

The "Inside" Story of the Hevi Duty Carburizer is the story of its national use in mass production of carburized parts, and of its flexibility for use in Nitriding . . . Bright Annealing and Clean Hardening. The "Inside" story of its design, durable construction and efficient operation is told in the new Hevi Duty Carburizer Bulletin HD-142 — Send for your copy.

Typical "Inside" view of the Hevi Duty Carburizer

HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES ~~HEVI-DUTY~~ ELECTRIC EXCLUSIVELY

MILWAUKEE, WISCONSIN

Are you having Difficulty

Getting TAPS?

...then get together with the PARKER-KALON Assembly Engineer!

He may be able to show you how you can *get along without taps* on many metal and plastic assembly jobs.

With the properly engineered use of PARKER-KALON Quality-Controlled Self-tapping Screws you can eliminate many tapping operations – you can save the cost of taps and the expense of maintaining tapping equipment.

You'll speed up the production rate of your assembly line, too. You'll save the time of salvaging rejected parts due to crossed and mistapped threads . . . eliminate the need for lock washers . . . do away with the fumbling that goes with bolts and nuts . . . cut out riveting in hard-to-get-at places . . . and you'll eliminate the need for tapping plates on thin sheets, and for inserts in plastics

These savings are made possible with P-K Self-tapping Screws! Get together with a P-K Assembly Engineer without delay, and learn how to put these benefits to work in your plant. P-K Self-tapping Screws require no special tools or special skill to handle – no costly changeover. For the help of an engineer, write Parker-Kalon Corp., 194-200 Varick Street, New York.

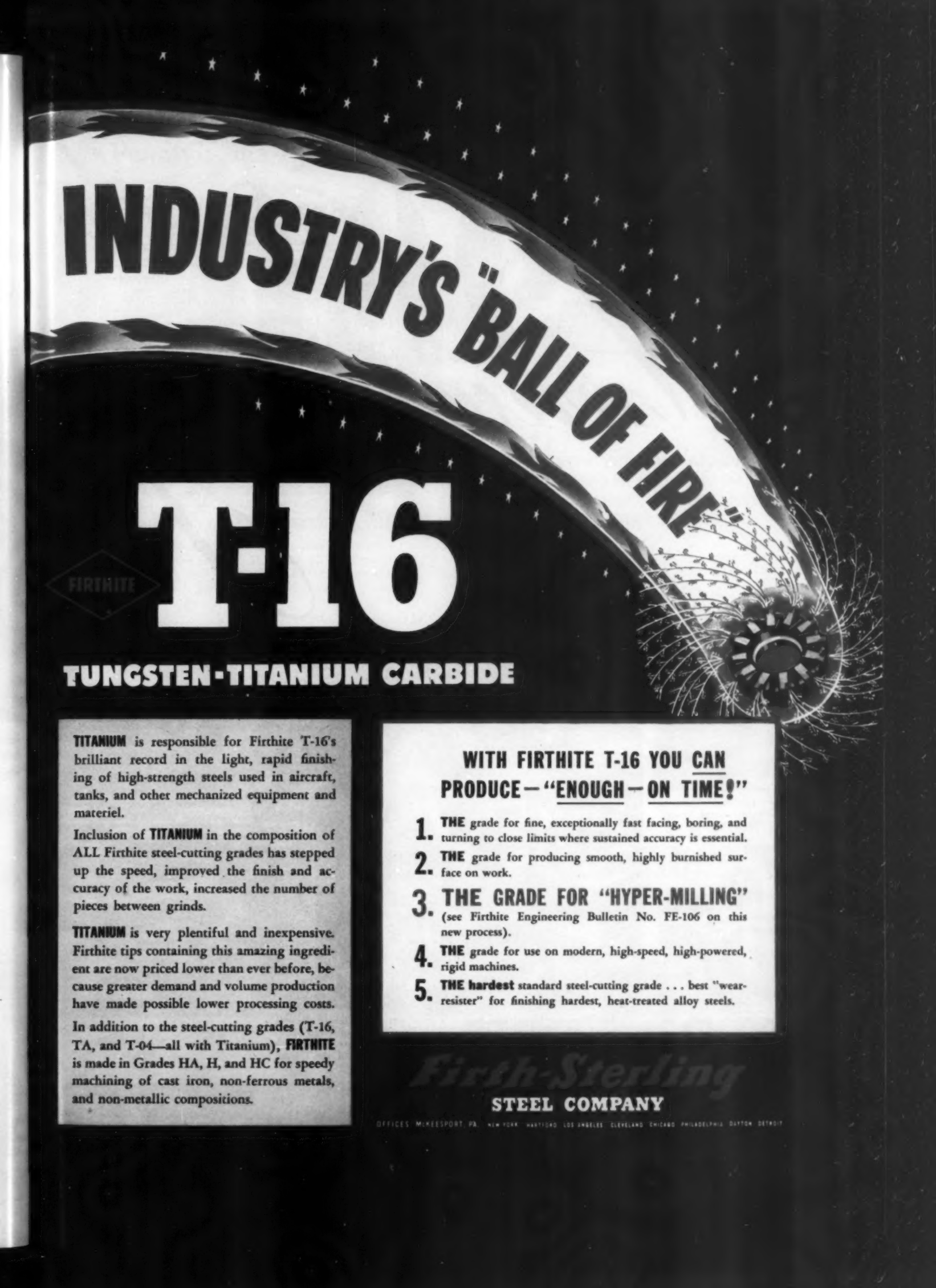
PARKER-KALON

Quality-Controlled

SELF-TAPPING SCREWS

Give the Green Light • to Defense Assemblies

SELF-TAPPING SCREWS FOR EVERY METAL AND PLASTIC ASSEMBLY . . . AND OTHER FASTENING DEVICES



TITANIUM is responsible for Firthite T-16's brilliant record in the light, rapid finishing of high-strength steels used in aircraft, tanks, and other mechanized equipment and materiel.

Inclusion of **TITANIUM** in the composition of ALL Firthite steel-cutting grades has stepped up the speed, improved the finish and accuracy of the work, increased the number of pieces between grinds.

TITANIUM is very plentiful and inexpensive. Firthite tips containing this amazing ingredient are now priced lower than ever before, because greater demand and volume production have made possible lower processing costs.

In addition to the steel-cutting grades (T-16, TA, and T-04—all with Titanium), **FIRTHITE** is made in Grades HA, H, and HC for speedy machining of cast iron, non-ferrous metals, and non-metallic compositions.

WITH FIRTHITE T-16 YOU CAN PRODUCE—"ENOUGH—ON TIME!"

1. **THE** grade for fine, exceptionally fast facing, boring, and turning to close limits where sustained accuracy is essential.
2. **THE** grade for producing smooth, highly burnished surface on work.
3. **THE GRADE FOR "HYPER-MILLING"** (see Firthite Engineering Bulletin No. FE-106 on this new process).
4. **THE** grade for use on modern, high-speed, high-powered, rigid machines.
5. **THE hardest** standard steel-cutting grade . . . best "wear-resister" for finishing hardest, heat-treated alloy steels.

Firth-Sterling

STEEL COMPANY

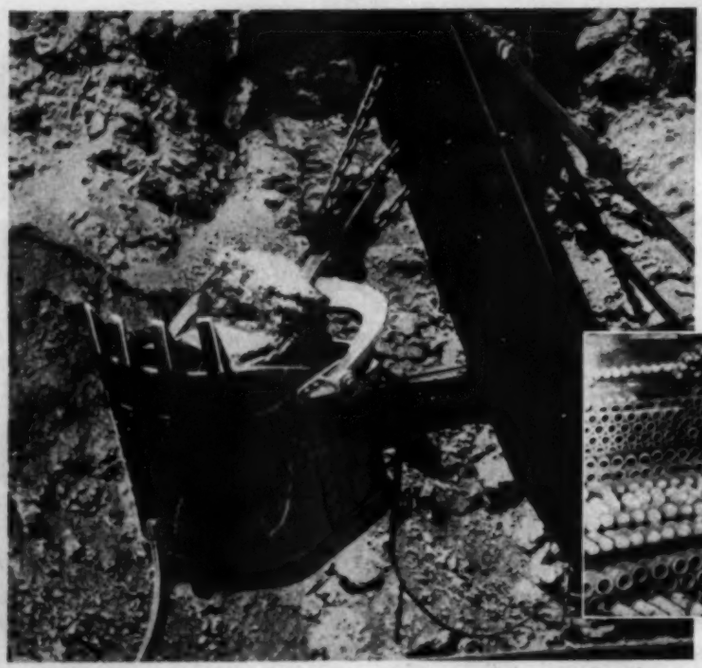
OFFICES: McKEESPORT, PA. NEW YORK HARTFORD LOS ANGELES CLEVELAND CHICAGO PHILADELPHIA DAYTON DETROIT

1742

200th Anniversary

Mold used to cast cannon balls for the Continental Army. 1775-1781

Cast steel projectiles made for U.S. Navy during Spanish-American War.



The Panama Canal was dug to a great extent by power shovels fitted with "Panama" patented Two-Part Teeth, of Tisco Manganese Steel made at our High Bridge Plant. This photograph shows a shovel in operation during construction of the Canal.

U. S. Army helmets made of Tisco Manganese Steel during World War I.

9.2" shell forgings made for World War I.

1742 TW 1942

TAYLOR • WHARTON

1942

THE Nº 6

Pennsylvania Journal,

OR

Weekly Advertiser.

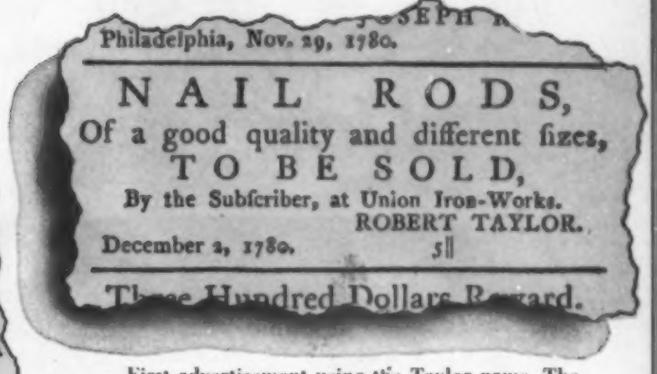
TUESDAY January 11. 1742-3.

This Day arrived here Capt. Fleming from London, by whom we have the following Advices, viz.

NUREMBURGH, October 4 O. S.

and there is within the Bound of the Hammor several Iron Works and nigh to it a Meeting House. Also two other Tracts of Land containing 500 Acres in *Bethlehem*, a small distance from the Furnace that *William Allen* is building. Whoever inclines to purchase any part or the whole, may treat with *Isaac Pearson* in *Burlington* and know the Terms.

First newspaper reference to this Company. In the above issue of Tuesday, January 11, 1742-3, of The Pennsylvania Journal, note the mention of "the furnace that William Allen is building."



Philadelphia, Nov. 29, 1780.

NAIL RODS,

Of a good quality and different sizes,

TO BE SOLD,

By the Subscriber, at Union Iron-Works.

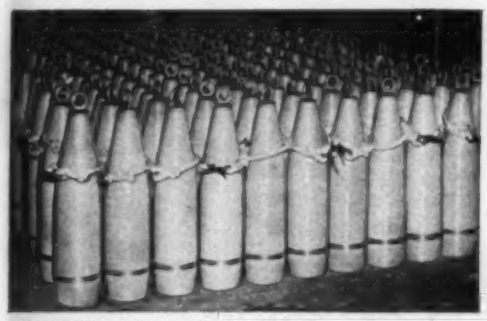
ROBERT TAYLOR.

December 2, 1780. 5ll

Three Hundred Dollars Reward.

First advertisement using the Taylor name. The above clipping is from the New Jersey Gazette, December 6, 1780.

COINCIDENT WITH THE 50th ANNIVERSARY OF HADFIELDS MANGANESE STEEL IN AMERICA, FIRST PRODUCED AT HIGH BRIDGE, NEW JERSEY, ON OCTOBER 29, 1892



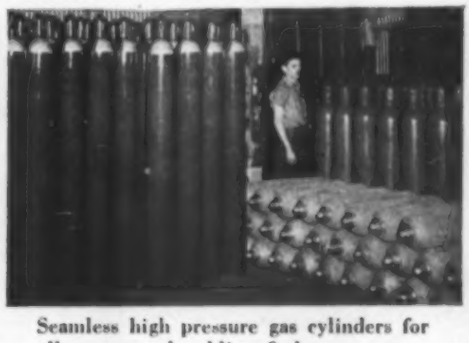
155 M.M. shells made for U.S. Army for present World War.

Photograph at left shows a Tisco Patented Rivetless Bucket made for placer dredges.

Crusher with wearing parts of Tisco Manganese Steel.

Special trackwork for railroads and Army and Navy installations.

Tisco Manganese Steel Tank treads for World War I and present World War.



Seamless high pressure gas cylinders for all compressed and liquefied gases.

IRON AND STEEL COMPANY

Steel from Weirton's roaring mills

. . . to the hull of an Axis raider

Today, the mills of Weirton are roaring at top speed to produce steel—and more steel—for Victory. Steel for aerial bombs, shells, guns, gun mounts and the hundreds of other weapons of war must be of uniform quality to insure accuracy.

Weirton's "double control" by men and machines is geared in war, as in peace, to meet the most exacting requirements in steel-making. And there will be no let-up by the Weirton corps of workmen in the Battle of Production until ultimate victory is ours.

WEIRTON STEEL COMPANY

Weirton, West Virginia

Sales Offices in Principal Cities

Division of

NATIONAL STEEL CORPORATION

Executive Offices · Pittsburgh, Pa.

40 MEN AND A JEEP

"GETTING there fustest with the mostest men" is still rule one for winning a battle. Today's wars depend upon the speed with which troops and their fighting equipment can be moved to the place where they are needed.

Rolling off production lines in America's great aircraft factories are huge freighters of the airways—planes as big as a boxcar that can span a continent between daylight and dark.

These leviathans of the air owe their tremendous carrying capacity as well as the speed with which they fly to the giant engines that power them.

To transmit the power of thousands of horses to whirling propeller blades, the gears in these engines must of necessity be held to such close tolerances that engineers have long considered them a laboratory product.

But laboratory methods of production could not be expected to furnish enough gears for the thousands upon thousands of fighting planes, bombers, and transports that are required to win a war.

The solution came in the production of gears of laboratory precision by mass methods, and today in the precision gear plant of Foote Bros., modern industrial might is helping solve the problem of more horsepower for engines—produced in ever-increasing quantities to meet war's insistent demands.

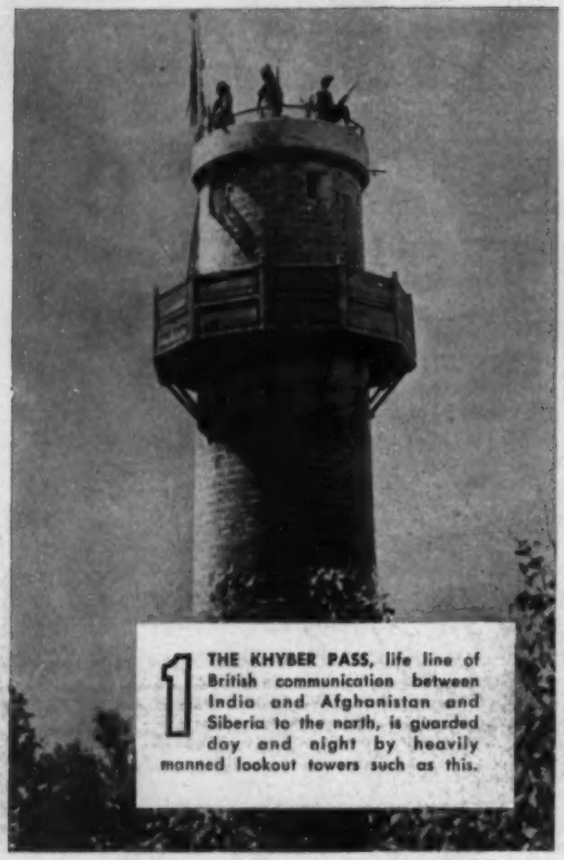
These new techniques—these new skills translated into post-war production mean that peacetime speed reducers and peacetime gears will assure better machines—quieter machines—that promise greater savings to American manufacturers.

FOOTE BROS. GEAR AND MACHINE CORPORATION
5301 S. Western Boulevard • Chicago, Illinois

FOOTE BROS.

SPEED REDUCERS • GEARS • SPECIAL ASSEMBLIES

FAMOUS LIFE LINES



1 THE KHYBER PASS, life line of British communication between India and Afghanistan and Siberia to the north, is guarded day and night by heavily manned lookout towers such as this.

International Newsphoto

2 U. S. ARMY EXPEDITIONARY GAS CANS, used by the hundreds of thousands wherever there are gas propelled military vehicles, tanks or aircraft, have their life lines —their air vent tubes—of Bundy Tubing.

Press Association, Inc.

NEW USES, new life lines, new roles of vital importance for Bundy Tubing increase as war production grows. From Army gas cans to smoke bombs, from "walkie-talkies" to tractors and tanks, Bundy Tubing is on the job . . . in new types and new sizes . . . accepted as standard for strength, ductility and resistance to vibration fatigue.

Lubrication lines for mine sweeper and "mosquito" boat power plants, for searchlight units and gun carriages . . . fuel lines for tank destroyers and cargo trucks, for weapon carriers and armored cars . . . hydraulic brake tubing and control tubing for heavy Army wreckers, for reconnaisance and command cars . . . rip cord grips for parachutes, control tubes for propellers, shade rib support tubing for magnesium parachute flares . . . structural tubing for aircraft and gliders . . . these are but a few of hundreds of new war applications of Bundy Tubing.

If you need tubing for your war products, be sure to get the complete story of Bundy Tubing's adaptability, its wide range of sizes and the splendid research facilities and cooperation offered you by Bundy's Engineering Department. Bundy Tubing Company, Detroit, Michigan.

BUNDY TUBING

ENGINEERED TO YOUR EXPECTATIONS

BUNDYWELD double-walled steel tubing, hydrogen-brazed, copper-coated inside and outside. From Capillary sizes up to and including $\frac{1}{4}$" O. D. This double-walled type is also available in steel, tin-coated on the outside, and in Monel.

BUNDY ELECTRICWELD steel tubing. Single-walled — butt welded — annealed. Available in sizes up to and including 2" O. D. Can be furnished tin-coated outside in smaller sizes.

BUNDY "TRIPLE-PURPOSE" tubing. Double-walled, rolled from two strips, joints opposite, welded into a solid wall. Available in all Monel; all steel; Monel inside—steel outside; Monel outside—steel inside. Sizes up to and including $\frac{5}{8}$" O. D.

DEPENDABLE EQUIPMENT

to Help Push Production

"Over the Top"

Meet today's defense needs with accurate, long-lived Brown & Sharpe Equipment – to get out the work *fast*.

We are proud to be honored with the Navy "E", awarded for outstanding accomplishment in Defense production.

Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.

BROWN & SHARPE

FOR THE HEAT OF WAR PRODUCTION

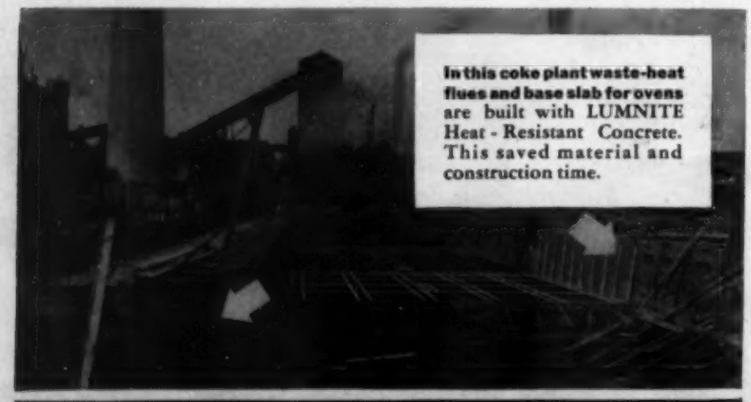
Use Refractory and Heat-Resistant Concrete made with LUMNITE

IN THE FURNACES, ovens and kilns of industry, Refractory Concrete, made with LUMNITE, confines and saves the heat that forges the instruments of war. It's in furnace walls, linings, and arches . . . in the arches of annealers and stress-relieving furnaces . . . the doors of foundry ovens and the tops of annealing cars . . . in door linings, ducts and flues of coke plants.

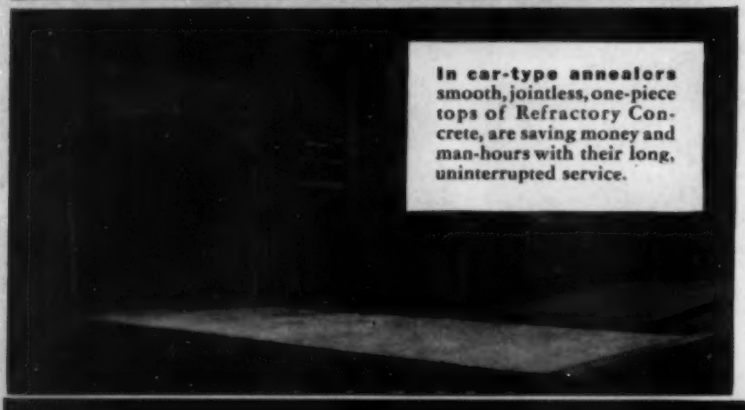
Time is being saved by using Refractory Concrete for construction and maintenance in a great variety of furnaces—from tool-shop tempering units to mammoth blast furnaces. Refractory *Insulating* Concrete is helping to meet the critical need for insulating refractories.

Our service forces are helping war plants make the most efficient use of LUMNITE. We will be glad to give you all available information on its application to your needs. The Atlas Lumnite Cement Company (United States Steel Corporation Subsidiary), Dept. S, Chrysler Bldg., New York City.

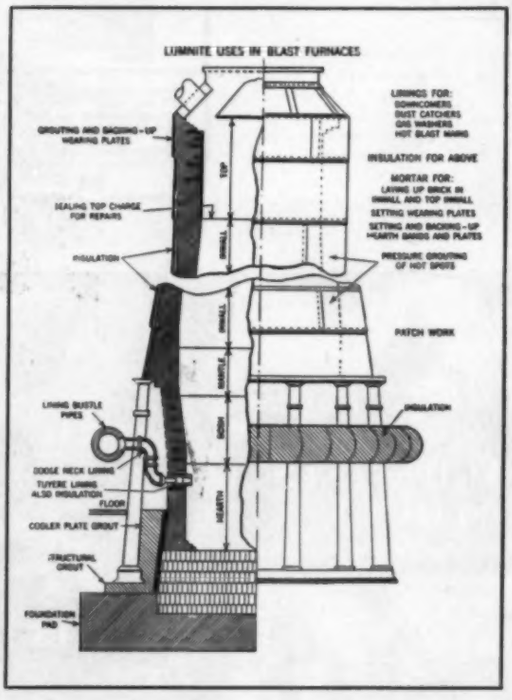
Tempering furnace lined with Refractory Concrete. This same plant uses LUMNITE in gas-fired boilers, the blacksmith shop heating furnace, and for a variety of special precast shapes. One installation leads to others because of economy in first cost and low maintenance records.



In this coke plant waste-heat flues and base slab for ovens are built with LUMNITE Heat-Resistant Concrete. This saved material and construction time.

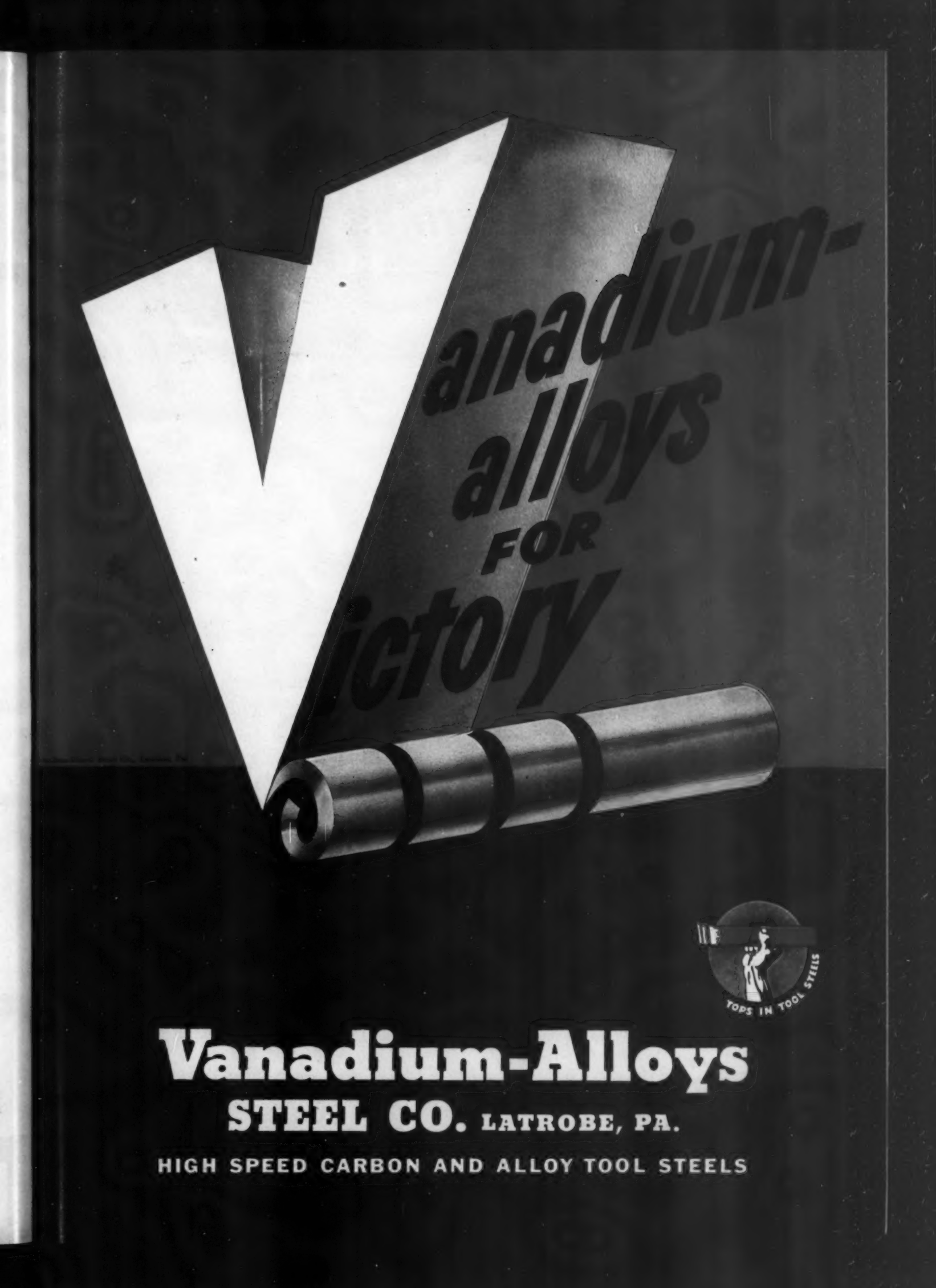


In car-type annealers smooth, jointless, one-piece tops of Refractory Concrete, are saving money and man-hours with their long, uninterrupted service.



20 uses of LUMNITE in blast furnaces are indicated in this diagram. Major steel companies use Refractory Concrete to avoid delays in maintaining and reconditioning blast furnaces and auxiliaries. Free bulletin tells about many different installations.

LUMNITE FOR REFRACTORY CONCRETE



Vanadium-Alloys
STEEL CO. LATROBE, PA.

HIGH SPEED CARBON AND ALLOY TOOL STEELS

HEAVY STEEL BLOCKS

CUT 8 TIMES FASTER

...by entirely new MACHINE GAS CUTTING TECHNIQUE

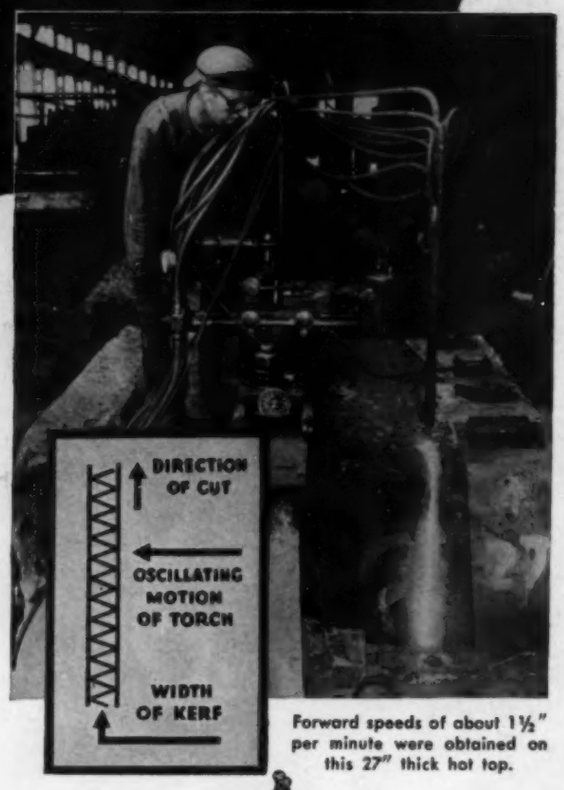
Hot tops — usually full of pockets, bricks and other non-ferrous materials — and rejected heavy steel ingots have long presented a difficult cutting problem. The job of reducing these heavy masses to charging box size has always been a slow, laborious process.

Could the oxyacetylene flame be used to speed this operation? This was a problem recently assigned to our Applied Engineering and our Research Departments by one of our customers. The result was an entirely new machine gas cutting technique.

This new technique utilizes a special Airco machine with an oscillating torch movement designed to cut kerfs up to 1½" wide. This enables the cutting oxygen stream to retain its cut when impurities or blow holes are encountered. Ingots 32" thick have been successfully cut at a forward speed of about 1" per minute — approximately 8 times faster than with former methods.

This special flame cutting machine is another development made possible by the teamwork of Airco engineers and our customers — each contributing their specialized knowledge towards one common objective.

Air Reduction's wartime policy is to help American industry do the tough job we all face. Our nationwide field engineering service and our research facilities are at your disposal to supply "know how" information on any problem involving the use of the oxyacetylene flame and the electric arc.



Forward speeds of about 1½" per minute were obtained on this 27" thick hot top.

AIR REDUCTION

General Offices: **60 EAST 42nd ST., NEW YORK, N. Y.**

IN TEXAS

MAGNOLIA-AIRCO GAS PRODUCTS CO.

General Offices: **HOUSTON, TEXAS**

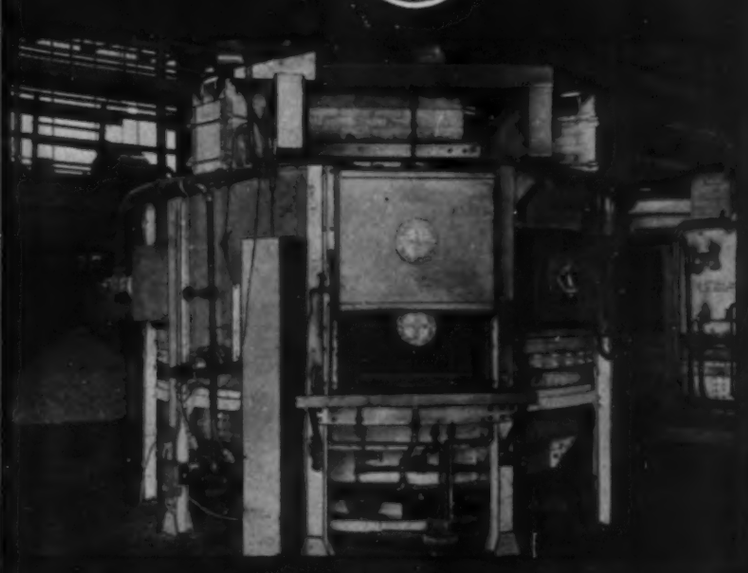
OFFICES IN ALL PRINCIPAL CITIES

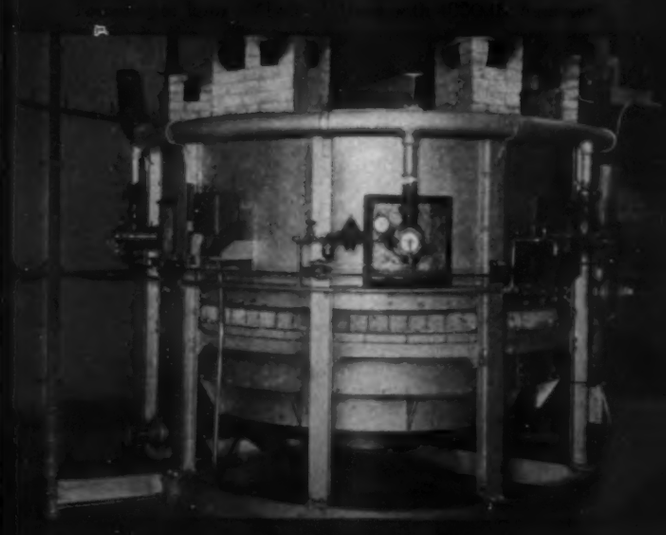
OXYGEN IS PRODUCTION—DON'T WASTE IT!

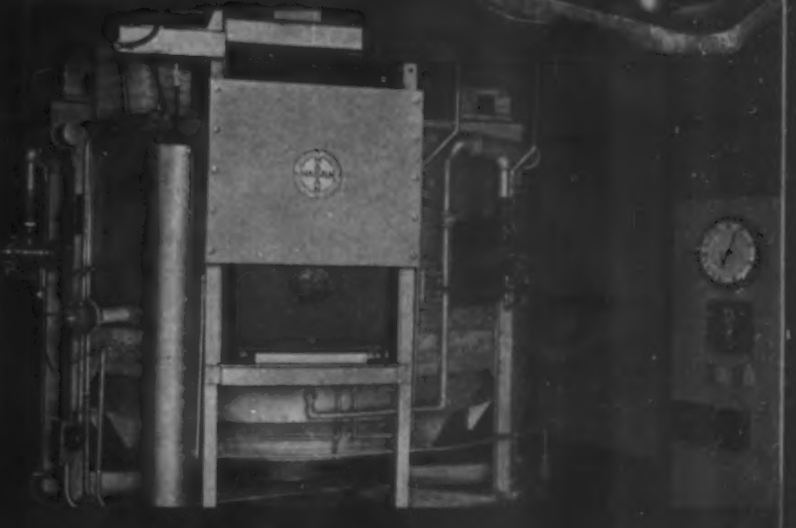
For HEATING SMALL FORGINGS MORE EFFICIENTLY IN WAR TIME AND POST WAR PRODUCTION—

HAGAN

Rotary Forging FURNACES







GEORGE J. HAGAN CO.

2400 E. CARSON ST., PITTSBURGH, PA.

DETROIT · CHICAGO · LOS ANGELES · SAN FRANCISCO

McKAY ELECTRODES SERVE SAFELY

ON AND UNDER THE SEVEN SEAS!

Down in the belly of a sub . . . with countless tons of crushing water between men and the blue sky . . . *safety* takes on a new meaning!

For the tiniest flaw could spell disaster when pressure skyrockets as the ship descends.

Aware of the grave responsibility imposed on arc welds, McKay Shielded-Arc Electrodes are made with a maximum of skill and care, and inspected with never-relaxing vigilance.

Here, as in other vital phases of war time marine construction, the advantages of the McKay "Researched Line" are demonstrated daily . . . advantages destined to make welding a safer, better, easier, cheaper production and construction method later.

THE McKAY COMPANY · PITTSBURGH, PA.

PACIFIC COAST SALES OFFICES: 125 S. Santa Fe Ave., Los Angeles · 100 Howard St., San Francisco

The McKay line includes regular carbon steel, stainless, and alloy steel electrodes for every welding purpose. Literature on request.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

★ The McKay Company was among the first honored with the coveted Navy "E" award for excellence in fulfilling Naval Ordnance contracts. ★

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

McKAY WELDING ELECTRODES

AND INDUSTRIAL, MARINE AND AUTOMOTIVE CHAINS

This Dust Hood
is doing "a job that couldn't be done"

● The dust nuisance resulting from the shaking out of dry sand molds was so severe in this foundry, that the operator of the overhead crane, who was of necessity directly over the shakeout, had to use a gas mask. It was impossible to see even 10 feet in any direction when a flask was being shaken out.

After other attempts to relieve the dust nuisance had failed, the management installed a Bartlett-Snow Side Wall Dust Hood (Des. 12170-) 12 long by 14' high, having 24 pyramidal shaped openings which deliver upwards of 33,000 cubic feet of air per minute to the plenum chamber connected with an underground duct to a Bartlett-Snow Wet Type Dust Collector located outside the building.

So great is the dust collecting capacity of this equipment—see illustration above—that it is now possible to shake out flasks 7' long, 3' wide, and 3' high on the most distant edges of the shakeout without any visible dust loss whatever,—and even to handle flasks 17' long, 5' wide and 3' high with only slight traces of dust loss even though these flasks are 7' longer than the shakeout itself.

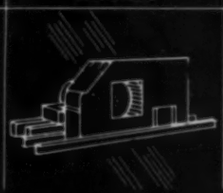
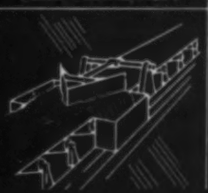
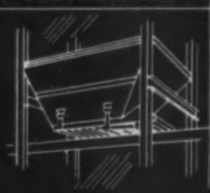
Our recently issued 40-page Foundry Bulletin No. 91 describes Bartlett-Snow Dust Collecting and other Foundry Equipment in detail and contains much information of interest to every foundry manager and operating engineer. Send for a copy today!

THE C. O. BARTLETT & SNOW COMPANY
6201 Harvard Avenue, Cleveland, Ohio
Engineering and Sales Representatives in the Principal Cities

H. S. Hervey, PRESIDENT

BARTLETT-SNOW
ENGINEERS AND FABRICATORS FOR THE FOUNDRY INDUSTRY

Complete Sand, Mold and Castings Handling Equipment for any requirement, including

Shakeouts	Elevators	Aerators	Sand Distributors	Bins and Feeders	Apron Conveyors	Dust Collectors
						

100% Bond Buyers
Non-Payroll Deductions 14%
Average Payroll

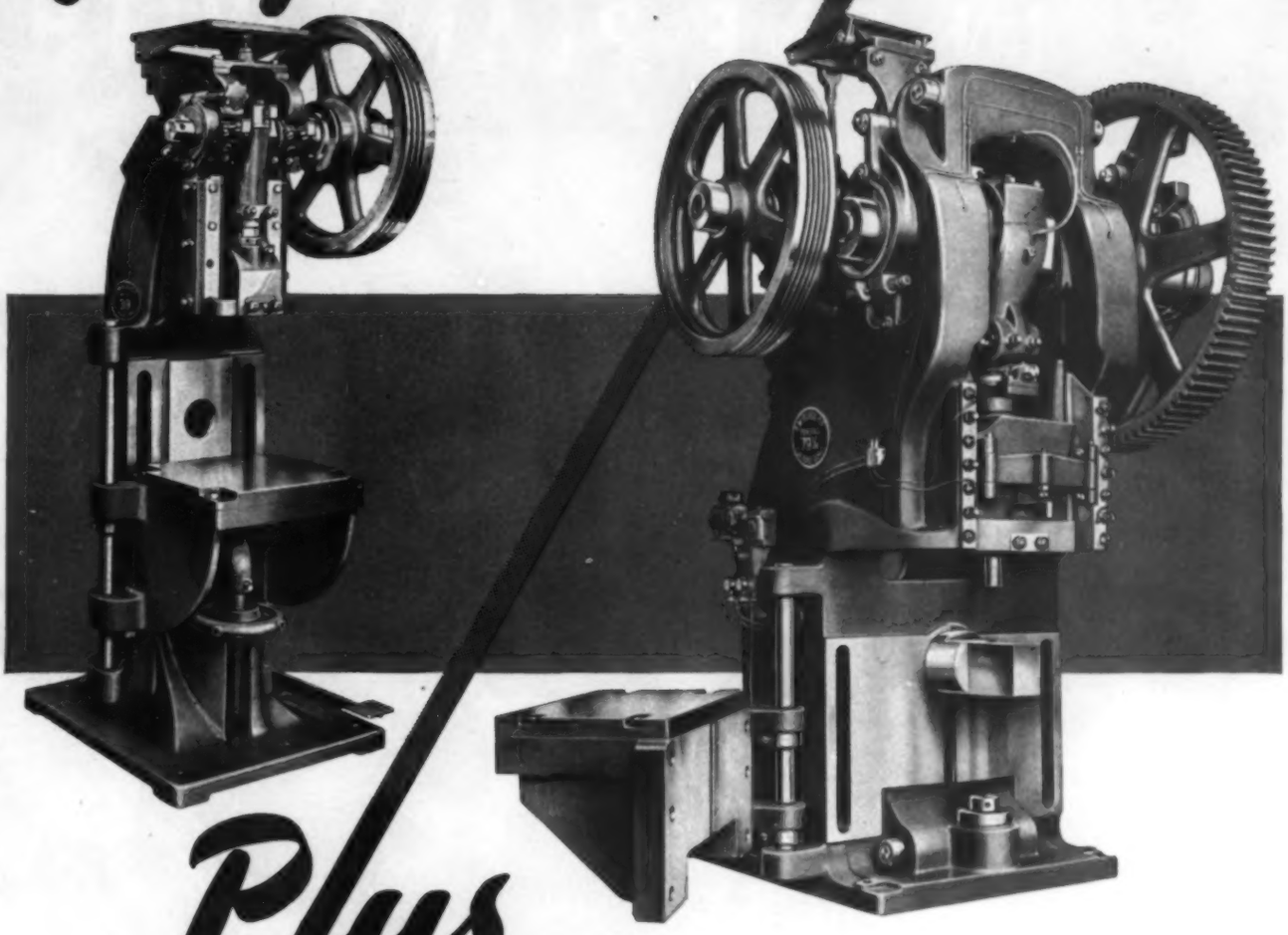
Visit Space D-111 at National Metal Congress

National need bears heavily now on one material, now on another, for the uses of wartime industry. In the *National Emergency Steels* that have lately been developed, Molybdenum plays an important part. As to the availability and usefulness of Molybdenum, Tungsten, and Boron, correspondence is invited by the Molybdenum Corporation of America. Printed matter is offered.

AMERICAN Production, American Distribution, American Control—Completely Integrated.
Offices: Pittsburgh, New York, Chicago, Detroit, Los Angeles, San Francisco, Seattle.
Sales Representatives: Edgar L. Fink, Detroit; H. C. Donaldson & Co., Los Angeles, San Francisco, Seattle.

MOLYBDENUM
CORPORATION OF AMERICA
GRANT BUILDING, PITTSBURGH, PA.

Adaptability



Plus

Inherent in Horn Press Construction through eighty odd years of Bliss Engineering Experience is adaptability to meet varying manufacturing conditions.

Adjustable beds for use with dies of different heights. **Horns** for seaming, bending, punching or riveting.

Overhanging frame, making possible the use of special fixtures and tools bolted to finished front of press frame.

Bliss Horn Presses serve many purposes in metal working operations and exemplify the economy in purchase and operation of Bliss engineered equipment.

BLISS · MARQUETTE · TOLEDO · CONSOLIDATED
BLISS BUILT

E. W. BLISS CO.

53d Street and Second Avenue

BROOKLYN · NEW YORK

BLISS

OVER 5000 POUNDS OF
...IN ONE PLANT WITH
ANOTHER WALLOP FOR THE AXIS

ZINC A WEEK SAVED...
PENNSALT CLEANER

EVERY POUND of essential metal saved is a blow against the enemy. Pennsalt Cleaners are doing forthright service in many industries, helping to conserve vital time and materials by faster, better metal cleaning—at lower cost.

Saving zinc by the proper removal of oil, grease and other soils from structural steel before galvanizing is an example. In one large fabricating plant rejects after galvanizing ran 20 to 25 per cent before Pennsalt Cleaners were introduced.

Now for the Pennsalt method:—Crates of steel parts are lowered by crane into a tank containing a steam-heated solution of Pennsalt Cleaner. After ten minutes they are taken to a rinse tank, then as they are removed they are water-sprayed. Pickling, rinsing, fluxing and coating operations proceed as before.

Result? Virtually *no* rejects! Average daily production up 20 per cent! And the zinc formerly lost due to stripping rejects now is *saved at the rate of over 5000 pounds per 80 hour week!* Over 260,000 extra pounds a year to help win this war. And this saving was made by only *one* manufacturer!

Many leading plants in every field of metal manufacture are saving needed materials and speeding cleaning operations with Pennsalt Cleaners. They are often able to dispense with hand labor and precleaning . . . and so cut cleaning costs.

In a wide range of duties, Pennsalt Cleaners are removing and preventing the redepositing of dirt—grease, oil, emery dust, rouge, carbon smut, grit. The metals and alloys they clean include carbon and alloy steels, stainless steel, copper, aluminum, zinc, nickel, nickel silver, Britannia metal, brass and bronze.

Whether the part is rolled, forged, stamped, drawn or cast . . . Pennsalt Cleaners are producing a remarkably clean, smooth surface that leads to a better job of Bonderizing, Parkerizing, enameling, painting, galvanizing or plating.

In the complete series of Pennsalt Cleaners, there is one which will meet the specific metal cleaning problem in *your* plant. All Pennsalt Cleaners have exceptional dissolving and emulsifying action, extraordinary lasting power and highly efficient cleansing qualities.

Let one of our experienced technical staff help you choose the Pennsalt Cleaner that will do most to save time, materials and money in your particular metal cleaning operations. Or write fully to our Pennsalt Cleaner Division, Dept. S.

PENNSYLVANIA SALT MANUFACTURING COMPANY

Chemicals

1000 WIDENER BUILDING • PHILADELPHIA, PA.

NEW YORK • CHICAGO • ST. LOUIS • PITTSBURGH • WYANDOTTE • TACOMA

Cleveland Single Point Presses

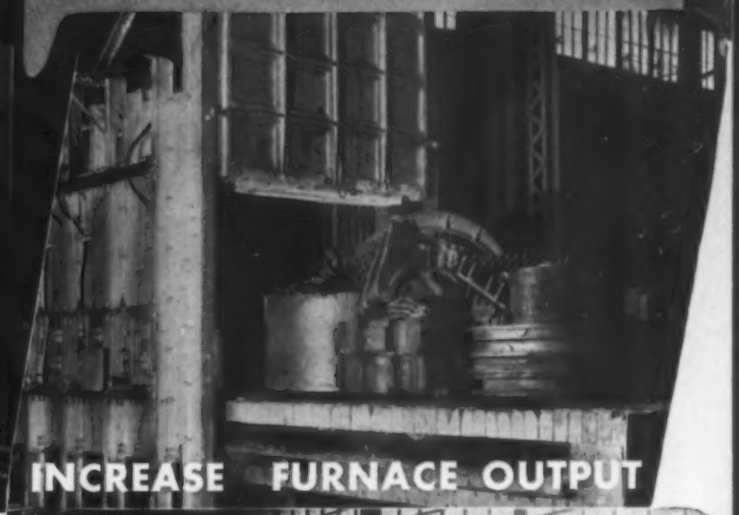
These two Cleveland Single Point Presses, which are designed with single connections located in the center of the slides, are typical of this Modern line which also embraces Two Point Presses having two connections and Four Point Presses having four connections, and each of the three types can be furnished in sizes and capacities to suit particular requirements.

The design of these Modern Cleveland Presses not only contributes to greater rigidity and ruggedness but to extreme accuracy in the production of duplicate parts and a considerable saving in overall floor space.

The 1-28-200 has a capacity of 200 tons while the 1-36-250 has a capacity of 250 tons.

Modern Presses THE CLEVELAND PUNCH & SHEAR WORKS COMPANY, *Cleveland, O.*

BROWN CONTROLLERS for TREATMENT OF METALS



INCREASE FURNACE OUTPUT

ELIMINATE REJECTS

HELP WORKERS

Quality and *Quantity* are most essential in producing tools of war.

If your plant is confronted with new and intricate temperature control problems in the treatment of metals for Planes, Guns, Tanks, Ships, etc.—you can rely on Brown Controllers to standardize quality and speed-up production.

Throughout the metal working industries, Brown Indicating, Recording and Control Potentiometers are helping skilled and unskilled workers to produce better quality—conserve war materiel—increase furnace output—eliminate rejects and re-treatments.

Whether you heat-treat steel—make die castings—bake enamel or do galvanizing—your war materiel, furnaces, time and money are staked on accurate temperature control.

That is why leading companies are turning to Brown and Minneapolis - Honeywell Control Systems for positive control of temperature processes. They are applicable for any type furnace—oil, gas or electric. You'll find them everywhere, on all makes of furnaces used for every kind of work where precision temperature measurement and control mean low cost furnace operation.

BROWN POTENTIOMETER CONTROLLERS

THE BROWN INSTRUMENT COMPANY, 4462 WAYNE AVENUE, PHILADELPHIA, PENNSYLVANIA
DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR CO.
MINNEAPOLIS, MINNESOTA, AND 119 PETER STREET, TORONTO, CANADA
Wadsworth Road, Perivale, Middlesex, England.
Nybrokajen 7, Stockholm, Sweden

Three-way Plan

TO HELP YOU WITH WAR WORK

1. A SPECIAL ENGINEERING SERVICE

Our metallurgists and engineers are prepared and equipped to cooperate with you in finding the correct solution for special metal problems. Their practical experience in the metal industry enables them to effect many production short-cuts by determining the one best metal for a specific application. In fact, the "custom-made" alloy you need may be one regularly produced by us.

To those metal working plants engaged in the manufacture of a new product, perhaps by unfamiliar procedures, we can provide helpful suggestions for working copper, brass, bronze and the high strength copper-base metals such as the copper-silicon alloys. This assistance is three-fold.

ANACONDA

Anaconda Copper & Copper Alloys

2. A LABORATORY YOU CAN CALL YOUR OWN

The Technical Department of The American Brass Company has acquired an invaluable back-log of metallurgical experience based principally on the fact that physical properties of copper alloys can be varied by controlled adjustment of composition and methods of fabrication. This technical information representing more than a century of experience and the laboratories responsible for it, are at your service in fitting the metal to the need.

3. TECHNICAL INFORMATION WRITTEN BY ENGINEERS

Also available to you without cost is a list of publications on copper and copper-alloys that are literally packed with useful technical information which your engineers will find extremely helpful: applications, compositions, physical constants and physical properties; fabricating procedures, including oxy-acetylene and electric welding of copper and copper-alloys. This and other important data is combined in many Anaconda publications. Send for a list.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

Made by The American Brass Company

Cuts time up to 75%

ON JOBS PREVIOUSLY HAND SCRAPED

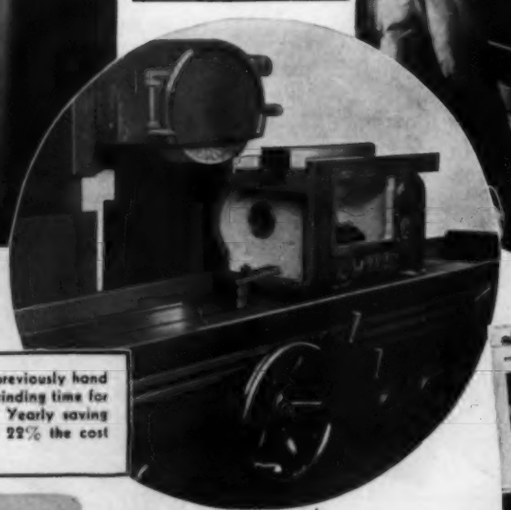
Examples: Time on pump case reduced from 40 hours to 4 hours . . . . . Time cut from 12 hours to 3½ hours on slide castings . . . . . Yearly saving on Housings — 22% the cost of machine, etc.

When added together, time savings like this not only make a big difference in manufacturing cost, but help speed up delivery schedules. To see what Mattison High-Powered, Precision Surface Grinders can do on your work, send us blue prints for production estimates.

● High Pressure pump case previously finished, planed and hand scraped in from 40 to 48 hours — Now the Mattison Grinder has made these operations unnecessary, reduced time to 4 hours and case comes through with a fine finish and accurate to within .0003".

● Cast iron slide previously rough planed, finish, planed and hand scraped — NOW GROUND on Mattison Grinder (6 pieces per set-up) at an 80% savings in time. Finish planing and scraping operations eliminated.

● Cast iron frame previously hand scraped, NOW GROUND top and bottom of casting, shoulder and inside surfaces. 75% time saving.



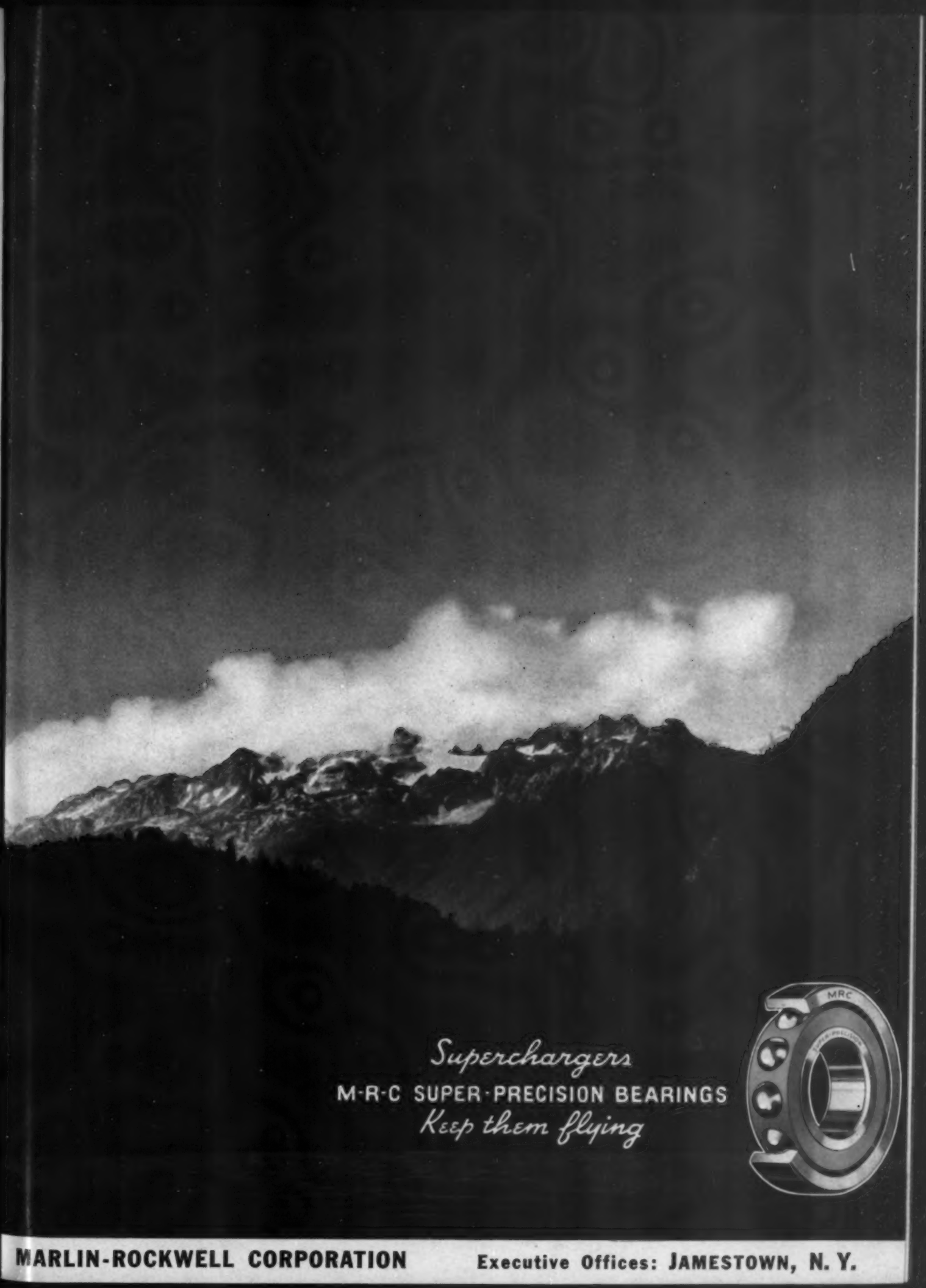
● Cast iron Housing previously hand scraped in 8 hours. Grinding time for housing is 2.5 hours. Yearly saving on this job alone was 22% the cost of machine.

SET-UP SHEETS

Containing complete information regarding these and similar jobs will be sent upon request.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS


Superchargers
M-R-C SUPER-PRECISION BEARINGS
Keep them flying
MRC
MARLIN-ROCKWELL CORPORATION
Executive Offices: JAMESTOWN, N. Y.

MAINTENANCE is today's problem at the front and *at home.* For full maintenance of operating efficiency and avoidance of replacement shutdowns in *STEEL MILLS* use . . .

. . . . . SINCLAIR LUBRICANTS.

Outstanding service is offered by Sinclair roller bearing greases, oils for circulating systems, gear oils, and cutting, tempering, and quenching oils.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.

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FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE NEAREST SINCLAIR OFFICE

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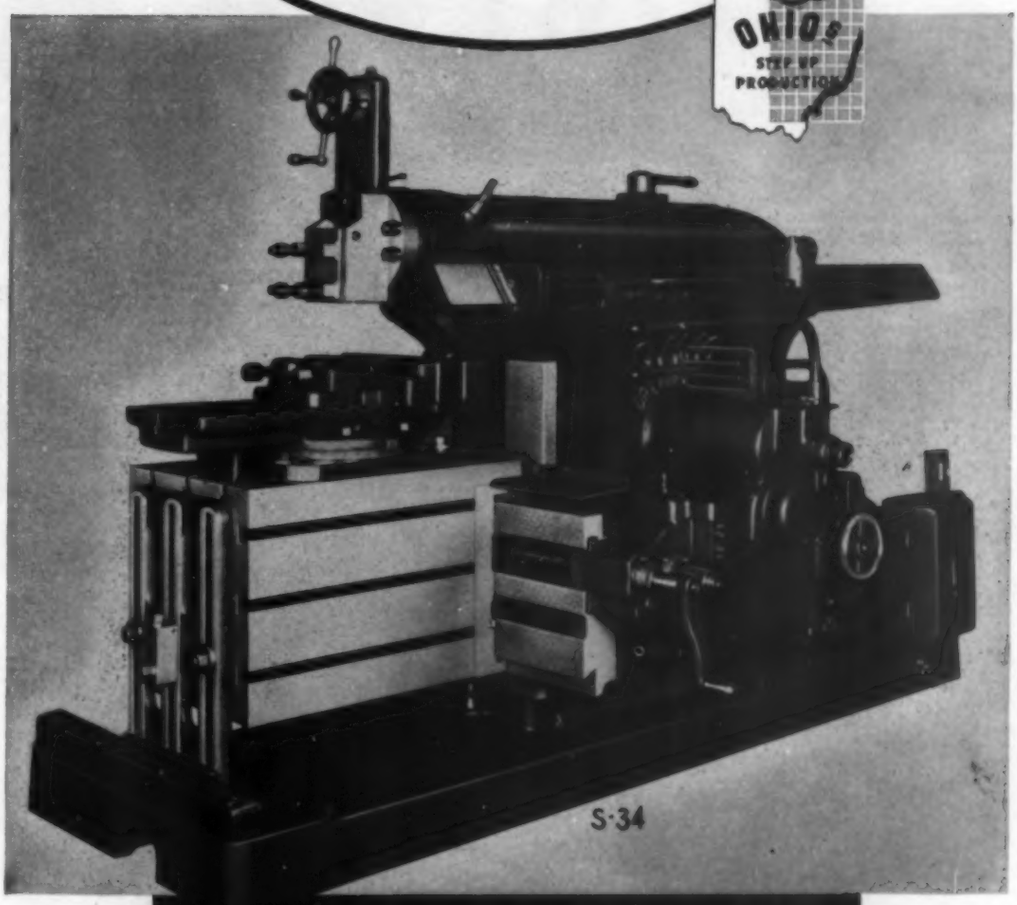
OHIO DREADNAUGHT SHAPERS



Ohio Dreadnaught Shapers respond to the call for top production with ample power and inbuilt rigidity plus a rare convenience, illustrated by one-position control, which makes the most of heavy duty construction. This is sound procedure for completing the maximum stint of perfect work in a given time. Many accessories and attachments meet any specific requirements.

THE OHIO MACHINE TOOL COMPANY
KENTON • OHIO

Orders for this machine are being shipped PROMPTLY

OHIO DREADNAUGHT
HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

... That ships can move Materiel-Munitions-Men

I AM PROUD TO FIGHT...

I began life as a 33,000 lb. white-hot billet of fine steel.

Forging Hammers and Presses, Heat-treating Furnaces, Machines and Men trained me down to fighting weight . . . around 10,000 lbs. ringside.

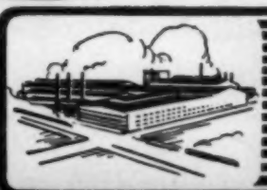
I drive Liberty Ships, Submarines, P-T Boats, the Diesels of War.

I am proud to fight for the United Nations . . .

I was wrought, forged, seasoned and machined by expert designers, engineers and craftsmen at Erie Forge Company.

My counterparts..Shafting, Connecting Rods, Crankshafts, Steel Forgings and Castings..are good tough fighters for the battle of the Nations and for Industry.

ERIE FORGE COMPANY, ERIE, PA.



They last "FOREVER"
BRASS
BRONZE
COPPER
EVERDUR
MONEL
STAINLESS
Yes . . . for practical purposes, Harper's fastenings last forever. They resist rust, corrosion and other destructive conditions. They last as long as anything they are made to fasten.
All Harper bolts, nuts, screws, washers, rivets and special fastenings are made exclusively of brass, bronze, Everdur, copper, Monel or stainless steel.
NECESSARY IN WAR
Because Harper's fastenings are so tough and durable, they are being used in a multiplicity of war equipment—such as ships, planes, guns and tanks.
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The number of Harper stock items . . . as well as the average quantity of each . . . is amazingly large. Many are rare and "hard-to-get."
UNUSUAL PRODUCTS
Over 40% of Harper orders cover fastenings larger, longer or otherwise different from stock items. Because of special machinery and large stocks of raw materials, such products go through promptly according to specifications.
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. . . and reference book—80 pages—4 colors —193 illustrations—numerous tables and other useful data. Complimentary when requested on a company letterhead.
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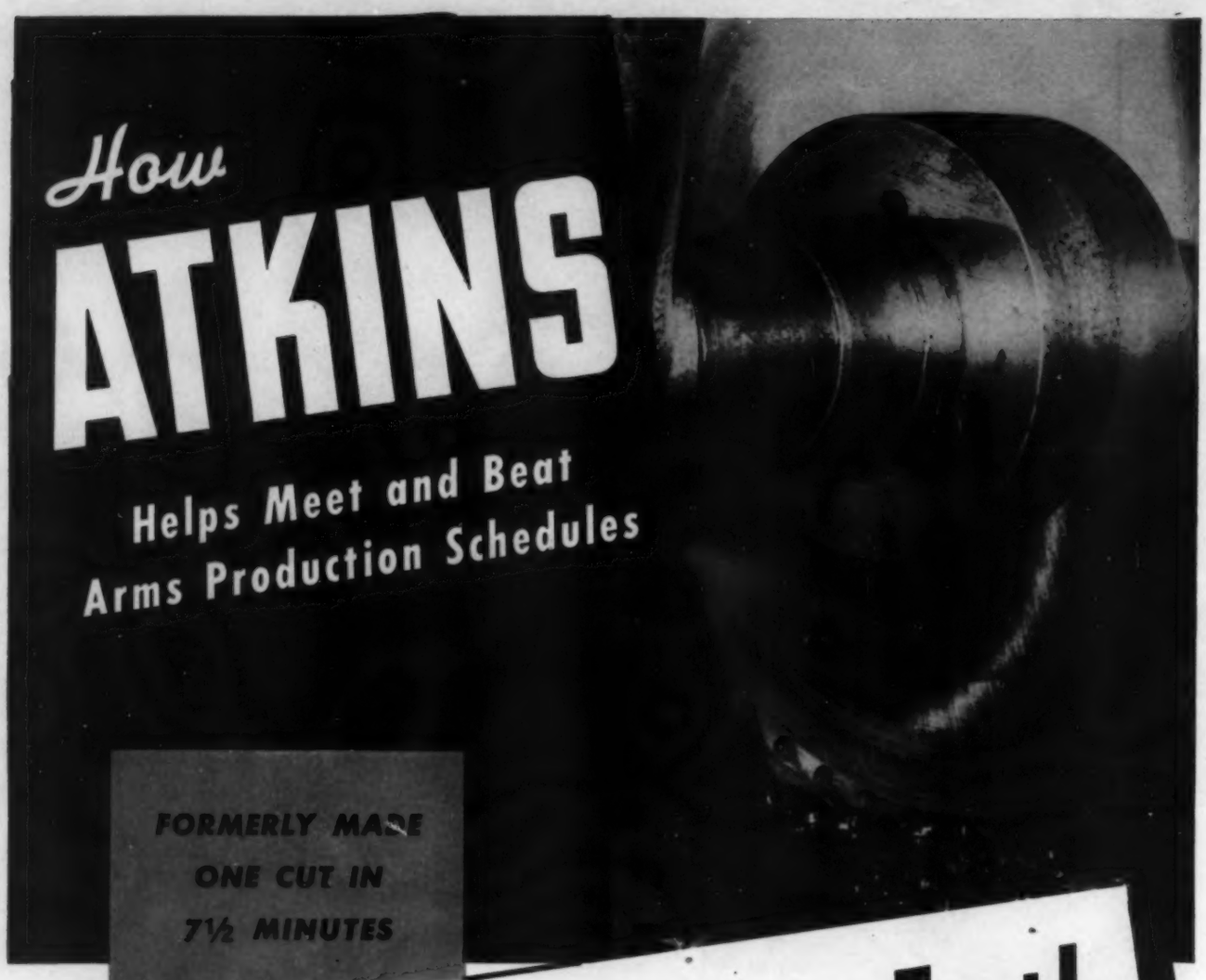
EVERLASTING FASTENINGS



How ATKINS Helps Meet and Beat Arms Production Schedules

FORMERLY MADE ONE CUT IN 7½ MINUTES

NOW CUTTING 45 Times as Fast!

TIME NOW SLASHED to 10 Seconds

That remarkable increase in cutting speed occurred on a job requiring the cutting of slots in electric cast steel arm brackets for army tanks. The saw was a 6" diameter Atkins Curled-Chip High Speed Milling Saw, equipped with the special 3-dowel Atkins drive. Upon the recommendation of the Atkins engineer, the saw was run clockwise, to cut up instead of down on the material (in contrast to previous practice on the job). This, plus the tremendous cutting speeds made possible by the recently-developed Curled-Chip tooth with its huge-sized inward-curving gullet, permitted cutting rates to be increased 45 times the former rate!

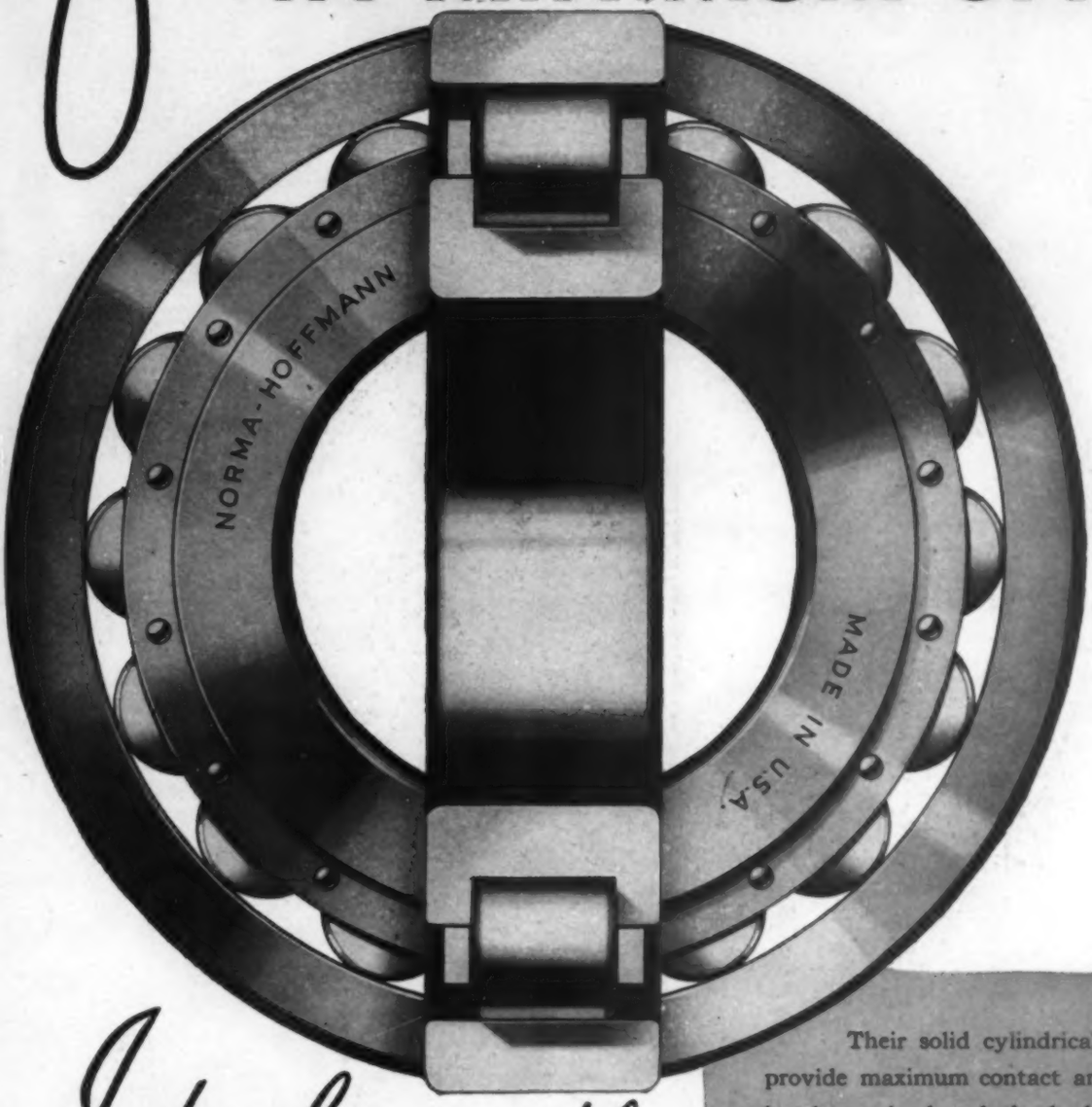
● The staggering performance of Atkins Curled-Chip Saws reported here shows the great possibilities for stepping up production by getting the right saw on the right job—and using that saw in the right way. With maximum production so vital to the whole arms program, plant men will be wise to question present performance on every job involving metal sawing. In shop after shop, the amazing records hung up by Atkins Curled-Chip Saws prove conclusively that former cutting standards can no longer be accepted as a measure of saw output.

To help you find out whether you are securing maximum production, call on Atkins for unbiased engineering aid. Without obligation, an Atkins engineer will investigate your cutting problems and tell you what can be done in the way of saving time and labor and reducing machine downtime on sawing operations.

E. C. ATKINS AND COMPANY, Indianapolis, Indiana

Originators of the Curled Chip SYSTEM OF METAL CUTTING

for MAXIMUM CAPACITY IN MINIMUM SPACE



Interchangeable

WITH SINGLE-ROW BALL BEARINGS

NORMA-HOFFMANN

PRECISION ROLLER BEARINGS

NORMA-HOFFMANN BEARINGS CORP'N.,

STAMFORD, CONN., U. S. A. • *Founded in 1911.*

Write for the Catalog. Let our engineers work with you.

Their solid cylindrical rollers provide maximum contact area, giving larger load and shock-absorbing capacity than any other single-row bearing of like dimensions. Thus, when NORMA-HOFFMANN PRECISION ROLLER BEARINGS are used in place of ball bearings, a greater factor of safety is provided, together with added life, particularly under vibration and overload. PRECISION qualities in workmanship and materials adapt them alike for both low and high speeds.

ARE YOU TRYING TO WORK IN A BLACKOUT?

If you need light on the proper selection and more efficient use of "war-time" steels . . . call on us

TODAY, you are being asked to use a number of unfamiliar steels, many of which have been especially developed to conserve strategic alloying elements. Even under ordinary circumstances, such a steel change-over would involve difficulties. But right now, when time is pressing and when this job must be done with the least amount of second guessing, the problems are immeasurably increased. We believe you can save yourself a lot of unnecessary trouble and delay by calling in our steel specialists.

These men were in on the ground floor and pioneered in the development of the National Emergency Steels. They know exactly what these new low-alloy steels are intended to do as alternates for the steels previously used. They have available—to pass on to you—the very latest information that hundreds of test applications of these steels have turned up.

Because they are constantly in touch with what is being done to meet the difficulties of the present situation, our steel engineers and metallurgists not only can safely guide you in *selecting* the steels that best fit your needs, but they can show you how to *apply* these steels with the minimum waste of time and with the least dislocation of your present fabricating process and heat treatments.

We urge you to take advantage of this offer. It is open to every user of Carnegie-Illinois steels, working on war equipment or on equipment indirectly essential to the war effort. It makes available to you not only the cooperation of more than 1200 steel metallurgists, engineers and research workers, but is backed by the seasoned experience and unequalled facilities of our 174 steel production and research laboratories. We offer you these services freely to further the common cause of Victory.

CARNEGIE-ILLINOIS STEEL CORPORATION

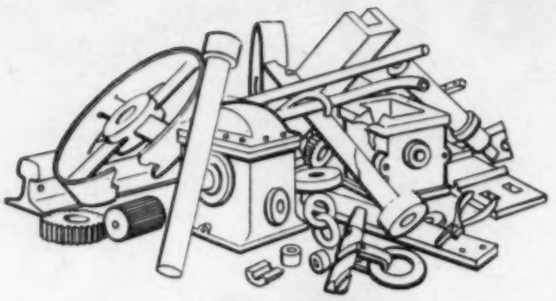
Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

UNITED STATES STEEL

USS

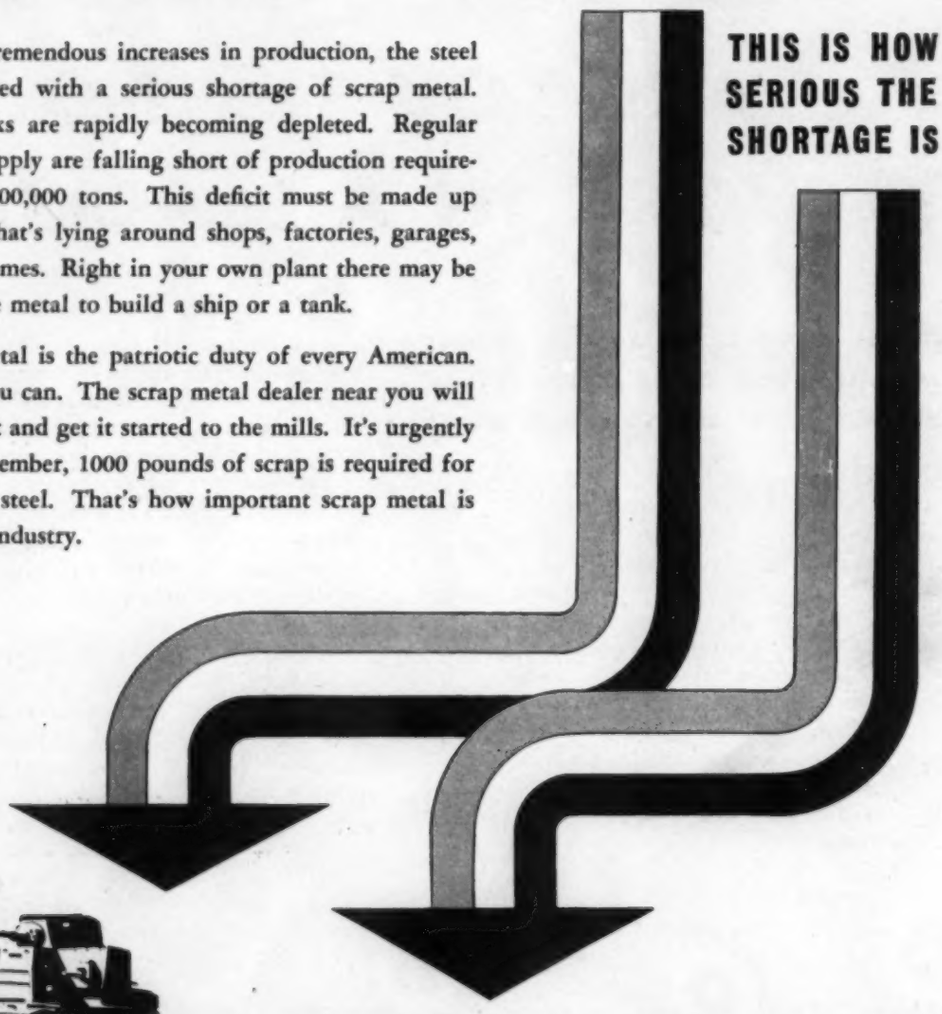
WE NEED YOUR SCRAP METAL

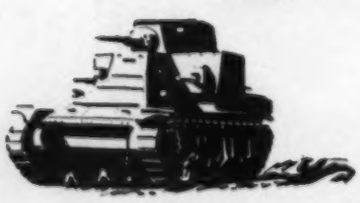


Because of tremendous increases in production, the steel mills are faced with a serious shortage of scrap metal. Reserve stocks are rapidly becoming depleted. Regular sources of supply are falling short of production requirements by 6,000,000 tons. This deficit must be made up from scrap that's lying around shops, factories, garages, farms and homes. Right in your own plant there may be enough waste metal to build a ship or a tank.

Salvaging metal is the patriotic duty of every American. Dig up all you can. The scrap metal dealer near you will pay you for it and get it started to the mills. It's urgently needed. Remember, 1000 pounds of scrap is required for every ton of steel. That's how important scrap metal is to the steel industry.

THIS IS HOW SERIOUS THE SHORTAGE IS

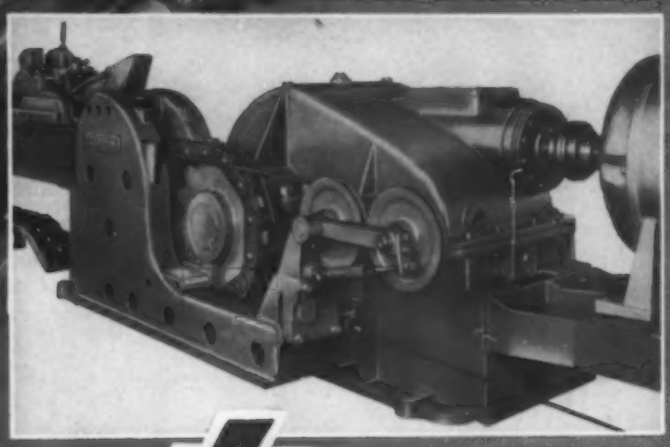




6,000,000 EXTRA TONS OF IRON AND STEEL SCRAP IS NEEDED NOW

If the mills don't get it, they may be forced to slow down or stop operation altogether. We just can't afford to let this happen.

THE ANDREWS STEEL CO.
NEWPORT, KENTUCKY
DIVISIONS
THE NEWPORT ROLLING MILL COMPANY
THE GLOBE IRON ROOFING & CORRUGATING CO.



Capacity

TO MEET YOUR REALLY TOUGH PRODUCTION SCHEDULES . . .

. . . AND MORE!

Vaughn

DRAW BENCHES

• • •

THE VAUGHN MACHINERY COMPANY

CUYAHOGA FALLS, OHIO, U. S. A.

VAUGHN MACHINERY *INCLUDES...*

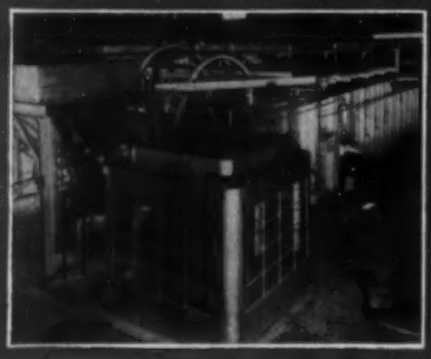
...plete cold drawing equip-...t—continuous or single hole ...r the largest bars and ...es—For the smallest ...—Ferrous, non-ferrous ...erials or their alloys.

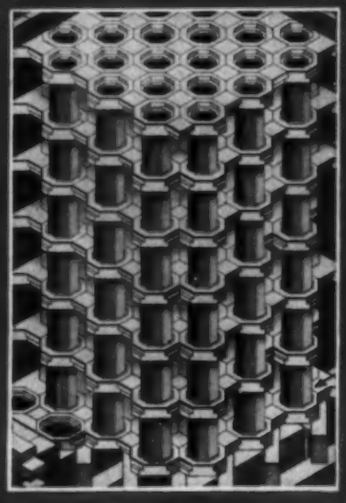
AMCO Equipment for WAR INDUSTRIES

Amco is the largest builder of Modern Pits in the world

Cold-End-Fired Continuous Slab Heating Furnace

Car-Type Annealing Furnace for Castings, Gun Forgings, etc.





Pulverized Coal Equipment and Pulverized-Coal-Fired Furnaces

Amco Recuperators—the outstanding recuperators in the field. Over 1100 installations for high temperature furnaces.

Furnaces of all sizes for Light Weight and Heavy Forgings

Circular Pit Type Heat Treating Furnace for Ingot and Gun Forgings

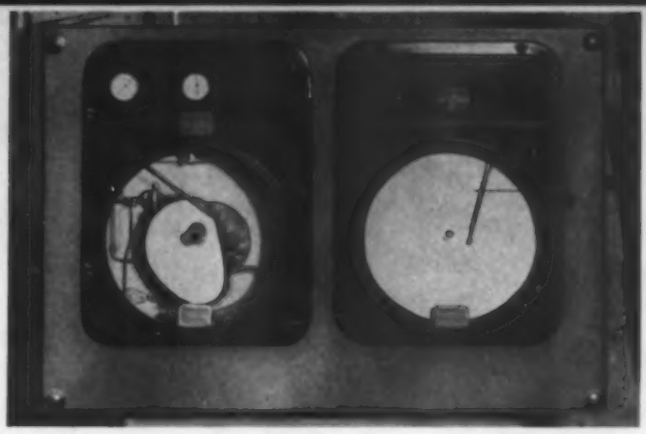
Rotary Hearth Furnace for Heating Blanks for 155 m.m. Shells

Heavy Duty Forge Furnaces

The AMSLER-MORTON Company

FULTON BUILDING · PITTSBURGH, PA.

PYROMASTER HELPS CUT STRESS-RELIEF CYCLE FROM 100 to 40 HOURS



After final welding of assembled units, one of the largest producers of electrical goods formerly required 100 hours for stress-relief heat-treatment. Bristol's Pyromaster Time-Temperature Controller made possible a 60% saving in time, by regulating cooling stages precisely according to schedule.

MANY VARIETIES FOR DIFFERENT NEEDS. Actually, Bristol's sensitive, practically maintenance-free Pyromaster is offered in six different top-notch potentiometers — models merely indicating, merely recording, recording-indicating, and controlling in three different styles. WRITE TO 112 BRISTOL RD., WATERBURY, CONN., FOR BULLETIN 507.

BRISTOL'S

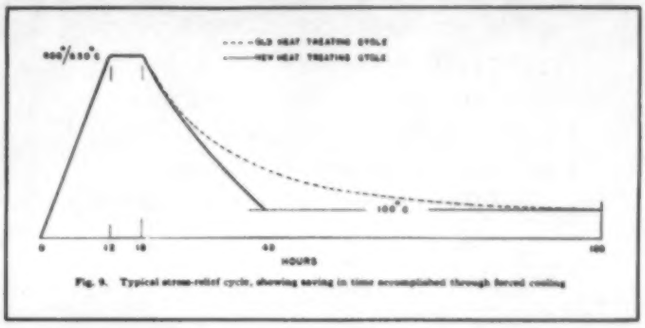


Fig. 9. Typical stress-relief cycle, showing saving in time accomplished through forced cooling

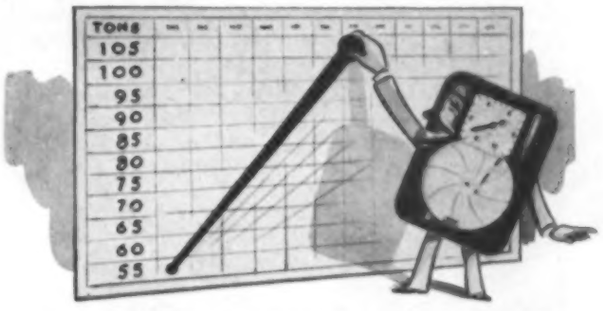
BRISTOL-CONTROLLED HOT BLASTS

Better Pig Iron
Less Labor and Fuel

With hot blast temperatures automatically controlled by Bristol's Pyromaster

- temperature in the smelting zone is made more uniform, maintaining constant quality, unvaried chemical composition of pig iron.
- furnace tender is freed from constant manual supervision, meaning less attention needed for a battery of blast furnaces.
- strains and stresses in blow pipes, tuyere stocks, bustle pipe linings are greatly reduced, lengthening their life, slashing maintenance costs.

BRISTOL'S



PYROMASTER REPLACES ON-AND-OFF POTENTIOMETER, UPS FURNACE OUTPUT 81.6%

On furnaces for bright annealing steel strip and wire, the on-and-off potentiometers formerly used resulted in widely varying flame length, inconsistent and inefficient heat input in preheating cell, unnecessary stresses on refractories. In place of those potentiometers went a coordinated set of 3 Air-Operated Pyromasters and a Process Cycle Controller.

RESULTS . . . FROM SAME FURNACES

	Tons per week			Average, 3 pairs of weeks
Old control	61	54	59	58
Pyromaster control	112	91	113	105⅓
Percent increase with Pyromaster	83.6%	68.5%	91.5%	81.6%

BRISTOL'S

BRISTOL

. . . Gives YOU the Most from Heat

THE BRISTOL COMPANY
WATERBURY, CONNECTICUT
THE BRISTOL CO. OF CANADA, LTD.
Toronto, Ontario
BRISTOL'S INSTRUMENT CO., LTD.
London, N.W. 10, England

AUTOMATIC CONTROLLING AND RECORDING INSTRUMENTS

Tool Conservation begins in the Tool Crib

A PLACE FOR EVERY TOOL...

In the conservation of tools, their proper care in the tool crib is just as important as their proper use. Tools misplaced, lost or damaged through poor housekeeping methods are out of production just as completely as those worn out or broken on the machine.

Note the conspicuous aisle and section locating discs, and drawer numbers. Corresponding symbols on the requisition, copied from a card index, enable even new employees to locate unfamiliar tools quickly.

Photo Courtesy Pratt & Whitney Aircraft

The direct labeling method is handy for departmental cribs or for the small shop.

Photo Courtesy American Bosch Corp.

and EVERY TOOL IN ITS PLACE

Increased production schedules mean more calls at your tool crib windows with a probability of more delays in handling "Window Traffic". Systematic layout of aisles, shelves, drawers and compartments will assure that every tool is where you want it when you want it.

• • •

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

DETROIT PLANT: 5850 Second Boulevard

WAREHOUSES in New York, Chicago and Los Angeles

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ARMY (E) NAVY

GTD GREENFIELD

TAPS · DIES · GAGES · TWIST DRILLS · REAMERS · SCREW PLATES · PIPE TOOLS

INDUCTION HEATING *with* TUBE CONVERTERS

For many applications, such as the brazing of certain parts, the heating of small sections, the degassing of vacuum tubes, etc., frequencies much higher than those given by the regular spark gap converter are desired. Vacuum tube converters are built in sizes from 5 to 60 Kw. delivering frequencies of 100,000 to 1,000,000 cycles.

CONTINUOUS — DEPENDABLE — HIGH OUTPUT

Predetermined results are assured—as to quality, quantity and cost of operation. These units are sturdy, dependable, efficient—arranged to give long tube life and freedom from breakdowns.

For a slight cost the unit can be converted from heating to brazing, or a dozen other applications.

EXPERIENCE

Ajax Electrothermic Corporation with its unparalleled experience offers any type of induction equipment which is best suited to the job — from a tiny spark gap equipment to the largest generator powered layouts.

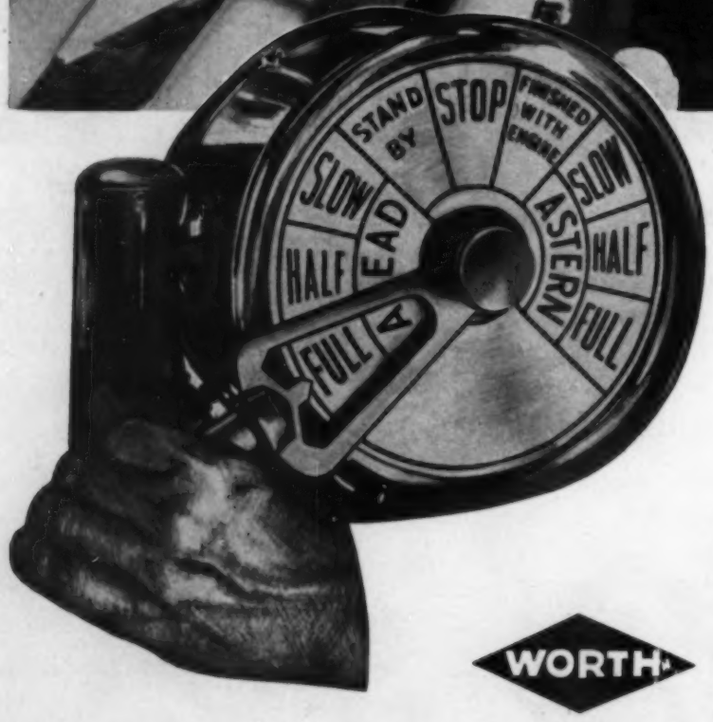
AJ-38

AJAX HIGH FREQUENCY FURNACES

NORTHRUP AJAX ELECTROTHERMIC CORPORATION, AJAX PARK, TRENTON, N.J.

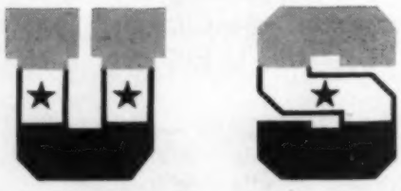
ASSOCIATE COMPANIES: THE AJAX METAL CO. *Non-Ferrous Ingot Metal for foundry use.*
AJAX ELECTRIC FURNACE CORPORATION. *Ajax-Wyatt Induction Furnaces for melting.*
AJAX ELECTRIC CO., Inc. *Ajax-Hultgren Salt Bath Furnace and Resistance Type Electric Furnaces.*

OFFICIAL U. S. NAVY PHOTOGRAPH



FULL SPEED AHEAD

FOR



More arms, more armed men, more munitions, more machines, more war materials, more food and supplies of every kind than this world has ever seen . . . that's the warpower we're mustering. It's a job that requires the best from all of us . . . And, we're proud to report to you that Worth production has reached an all-time high, and that an increasing flow of quality Sheared Steel Plates and Flanged and Dished Heads is being delivered to the United States Navy and other users, war-important.

WORTH

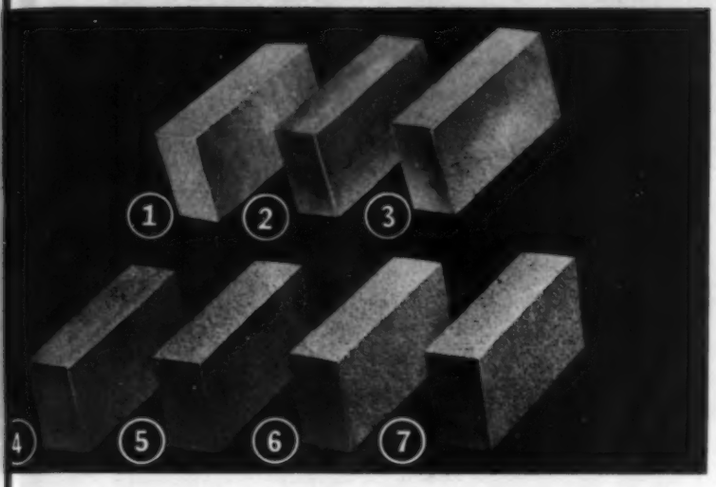
WORTH STEEL COMPANY

CLAYMONT, DELAWARE

For the

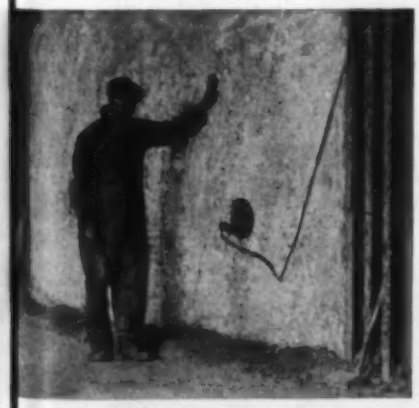
BIG INSULATING JOBS

In the Iron and Steel Industry . . .



Seven Types of Brick . . .

Three types of insulating brick: (1) Sil-O-Cel Natural Brick for temperatures to 1600° F.; (2) Sil-O-Cel C-22 Brick for temperatures to 2000° F.; (3) Sil-O-Cel Super Insulating Brick for temperatures to 2500° F. Four types of insulating firebrick—(4) JM-16 for temperatures to 1600° F.; (5) JM-20 for temperatures to 2000° F.; (6) JM-23 for temperatures to 2300° F.; (7) JM-26 for temperatures to 2600° F. All provide light weight, low cost, low conductivity. Furnished accurately sized in all standard sizes of the 2½" and 3" series, as well as in specials.



Semi-Refractory Insulating Concrete . . .

Sil-O-Cel C-3 Concrete is the ideal material for lining furnace doors and for insulating furnace bases. Weighs less than half as much as firebrick; has 3 times greater insulating value. Cast on the job from Sil-O-Cel C-3 aggregate and cement. Sets up into a strong, durable concrete for temperatures up to 1800° F. Furnished in 100-lb. bags.

Lastingly Efficient Block Insulation . . .

J-M Superex meets every steel-mill requirement for temperatures to 1900° F. Combines high heat resistance and great durability with exceptional insulating value. Standard sizes 3"x18", 6"x36" and 12"x36"; from 1" to 4" thick. Other sizes and thicknesses on order. J-M 85% Magnesia or Asbesto-Sponge Felted are often used outside of Superex, which construction is known as J-M Superex Combination Insulation.

Power Plant Insulations . . .

For many years the most widely used power plant insulations, Johns-Manville 85% Magnesia Blocks and Pipe Covering are today lighter in weight and more efficient than ever before. Standard-size blocks are 3"x18", 6"x36" and 12"x36"; from 1" to 4" thick. Other sizes, including lagging, furnished on special order. Pipe insulation is available in 3-foot lengths in thicknesses up to 3". For temperatures above 600° F., Superex Combination Block or Pipe Insulation is recommended—an inner layer of high-temperature Superex and an outer layer of 85% Magnesia. Sizes same as those of 85% Magnesia.

THESE ARE BUT A FEW of the many Johns-Manville Insulations that are helping assure dependable, uninterrupted operation of all types of heated equipment in the iron and steel industry. For details on all J-M Insulations, write for Catalog GI-6A. Johns-Manville, 22 East 40th Street, New York, N. Y.

JM Johns-Manville

INDUSTRIAL INSULATIONS

Saves Strategic Metals Speeds Production

It's easy to change rolls on a Yoder Roll Forming Machine.

A great variety of shapes from a wide selection of metals.

Yoder ROLL FORMING MACHINERY

SAVES STRATEGIC METALS... Meeting or beating this problem of a scarcity of certain metals is of primary importance at this critical time . . . and this is the way to do it! YODER Roll Forming creates no *fins,* no *chips,* no *skeletons,* no *scrap* of any kind, although other processes cause one-fourth to one-half of the metal to be scrapped. • Also, designers are stimulated to meet the situation by creating better products from more easily obtainable metals. They have found an "ace" advantage in that a "pass through the rolls" adds strength to baser metals.

SPEEDS PRODUCTION... Roll 'em out at "plunge" speeds up to two hundred feet per minute . . . precision formed, too! By combining machining with YODER Roll Forming operations, much more production per manhour without sacrifice of quality can be obtained . . . than by machining alone. • YODER Roll Forming is one way of "lengthening the production line" with no increase in man power needed. • Another important element in practical production procedure is ADAPTABILITY. On a YODER Roll Forming Machine, just change rolls (a matter of a few hours) and you're ready to run another job. Same machine . . . different rolls . . . new parts!

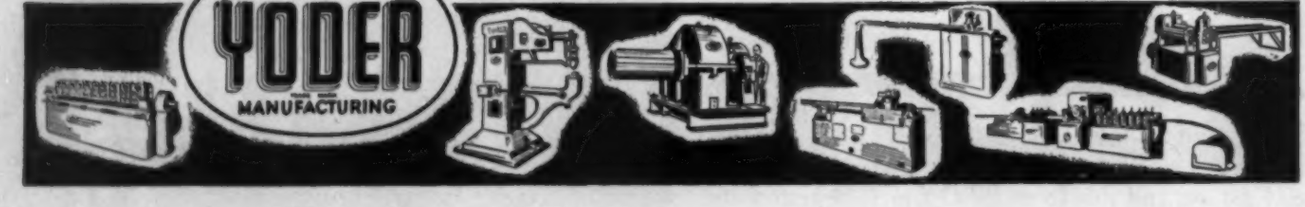
SAVE! CONSERVE! STIMULATE! SPEED-UP!

Roll 'em into action with Roll Forming Machinery. We would welcome your confidences.

THE YODER COMPANY • CLEVELAND, OHIO, U.S.A.

METAL • FORMING • PRODUCTION • MACHINERY

ENGINEERING YODER MANUFACTURING



REACH FOR A NEW HIGH IN
YOUR GRINDING PRODUCTION!
Armament production men working on "impossible" completion schedules appreciate more than ever the value of BAY STATE's consistently superior abrasive products. Such "engineered-in" features as Fractional Grades, Controlled Porosity, and H-9 Vitrified Bond have eased to a tremendous degree their great task of obtaining maximum output in minimum time, with ever-increasing grinding efficiency.
As a result of recent plant expansion and new tunnel kiln, deliveries are now better than ever. Use BAY STATE products for greater production!
Send for practical reference book containing a wealth of information on all types of grinding, including Foundry Wheels, Cut-Off Wheels, Mounted Points, Internal Wheel Recommendations, etc. Widely used for training apprentices, new operators and students. Yours on request.
BAY STATE
WHEELS of PROGRESS
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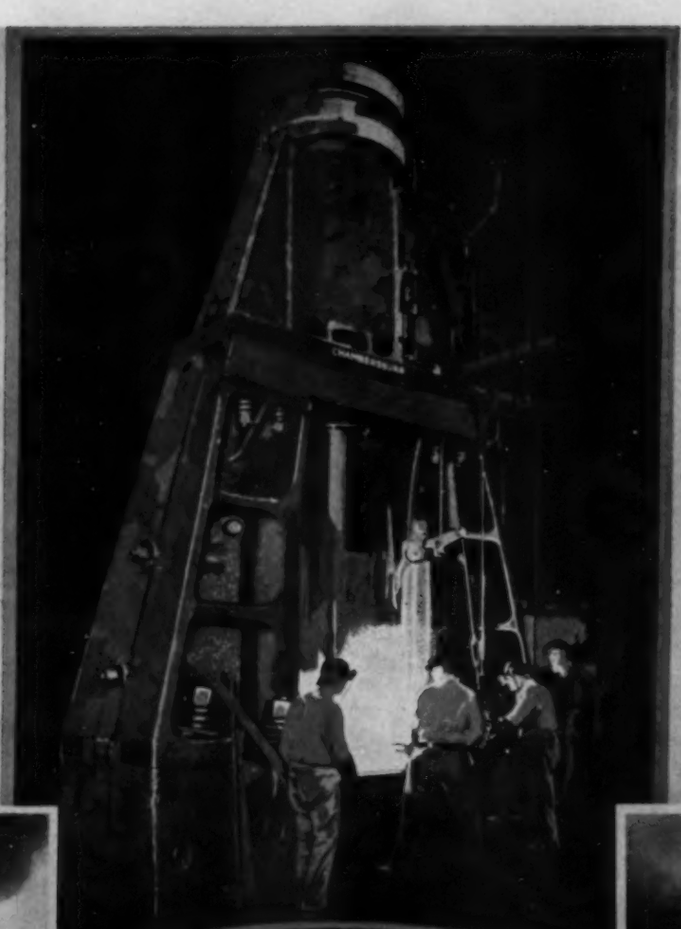
ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

Specimen Tank Parts Forged on Chambersburg Hammers



Airplane Engine Parts Forged on Chambersburg Hammers

FORGINGS COME FIRST

★

Forgings are vitally essential to the war effort because airplanes, tanks, ships and guns must be built to "withstand the unpredictable" . . . for which specification there is nothing to equal the strength and durability of the drop forging. ★ Before the cutting and grinding machine tools bring these parts to their final microscopic perfection, they are first forged to close limits, by tremendous impact between steel dies, in great drop hammers, such as those bearing the time-honored name of CHAMBERSBURG. Metal is saved, time is saved . . . and Victory brought closer . . . by the speed, power and accuracy of Chambersburg Hammers.

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

THE CECOSTAMP

Airplane and other sheet metal parts of high strength alloys are formed quickly and without distortion on the Chambersburg CECOSTAMP.

The Cecostamp is an impact stamping machine of exceedingly flexible control, designed by Chambersburg Engineering Company specifically for the aviation industry.

CHAMBERSBURG

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SPEEDING AMERICA'S PRODUCTION

The success of the Allied war effort depends greatly upon the speed of our production — the output of coils and sheets, castings and forgings, bars and shapes — and thousands of other vital materials. American Industry has already come through in a way that spells disaster for the Axis nations, and it's only the beginning.

Mathews Engineers are spending long hours in solving the many conveying problems which go along with this great production program. You can get Mathews engineering service and Mathews Conveyers with much less delay than you might think. By furnishing the highest preference rating you can possibly obtain, along with complete information regarding your problem, much time can be saved in obtaining the conveying equipment you require. Our job is to serve you in the most efficient manner possible.

MATHEWS CONVEYER CO.

ELLWOOD CITY, PENNSYLVANIA

If you are manufacturing war material, or anything vital to the success of the war effort, you can get Mathews Conveyers to handle that material Rely as usual on your Mathews Engineer.

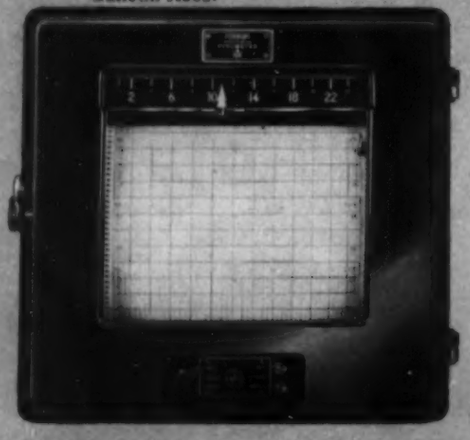
MATHEWS CONVEYERS FOR MECHANIZED PRODUCTION

COMPLETE

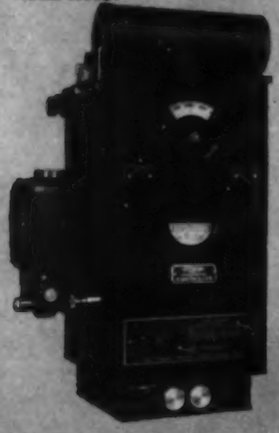
Potentiometer Indicator by Foxboro. Available with single point as shown, or with 2 to 18 built-in switch points. Self-balancing indicators also furnished. See Bulletin A-305.

Key switch cabinet Potentiometer by Foxboro gives quick, accurate readings of 2 to 82 temperature points with single instrument. See Bulletin A305.

Foxboro Portable Potentiometer Indicator. A rugged instrument with accuracy approaching laboratory standards, for testing and temporary installations. See Bulletin A303.



Foxboro Potentiometer Recorder keeps records of 1 to 8 temperature points. Exclusive balancing mechanism gives fast, split-hair recording with slow drive. See Bulletin 190-5.



Non-Recording Potentiometer Controller by Foxboro. Extra large parts give instant setting. Unique group-drive operates up to 8 instruments with single motor. See Bulletin 202-4.

Potentiometer Instruments

"TOOL KIT"

for solving wartime heat-control problems!

Are you striking snags in meeting today's tougher heat-treating specifications? . . . in getting capacity output? . . . in maintaining top production with a dwindling force of seasoned operators?

Foxboro's complete line of Potentiometer Instruments offers the right "tool" . . . a super-precision pyrometer . . . to help solve any of these problems, no matter what heat-treating set-up you employ.

Foxboro Potentiometer Indicators give proof-positive guidance of furnace temperatures to keep the *greenest* operator on the right track. Foxboro Potentiometer Recorders furnish the added protection of continuous, permanent records. And Foxboro Controllers of several types supply automatic control more accurate than any manual control.

In all these instruments, exclusive Foxboro simplifications and advances now cut lost motion and wear to rock bottom minimums . . . furnish guaranteed accuracy of ¼ of 1% of scale, or higher. Illustrations show seven of the Foxboro Potentiometer Instruments now helping war plants beat all previous records in heat treating.

Write for Bulletins covering the complete Foxboro line of pyrometers. The Foxboro Company, 118 Neponset Ave., Foxboro, Massachusetts, U. S. A.

by FOXBORO

Reg. U. S. Pat. Off.

Foxboro Recording Potentiometer Controller. Integral slide-wire contact and recording carriage eliminate all lost motion and assure highest precision. See Bulletin 240-1.

Stabilog Potentiometer Controller for pneumatic operated valves. Gives stabilizing control on many tough jobs never equalled by any other instrument. Widely known as "best temperature instrument made." See Bulletin 194-2.

Now THESE SPECIAL CLEANERS HAVE BEEN *Tested Under Fire On Every Front*
AND APPROVED FOR FASTER VICTORY PRODUCTION

See HOW THESE TESTED AND APPROVED *specialized* CHEMICALS AND COMPOUNDS *speed-up* VICTORY PRODUCTION AND *save* VALUABLE METALS BY REDUCING REJECTS

Prove by Test

A qualified MacDermid representative from one of the service offices listed below will be pleased to show you actual examples of chemically and metallurgically clean VICTORY productions — show you how to completely free your products of oils, greases and inorganic dirts in less time at lower costs.

Write Today

- **ANODEX** The *original* reverse current process and *special* compounds for cleaning ferrous metals. . . Recommended for steel shell cases and steel parts of engines.
- **METEX and METEX *AERO* COMPOUNDS** for faster, more efficient cleaning of brass, aluminum and alloys.
- **SOLVTEX and SOLVMAX EMULSION CLEANERS** for faster cleaning in spray and rotary washing machines.

SALES AND SERVICE
from
COAST TO COAST
New York Cleveland Los Angeles
Chicago Detroit St. Louis
Newark Philadelphia
Toronto, Canada

MAC DERMID
INCORPORATED
WATERBURY, CONNECTICUT

OEM Photo by Hollem

NOW YOU MUST LEARN *"HOW-TO-DO-IT"*

BETTER .. CHEAPER .. WITHOUT WASTE

CAN YOU USE HELP?

We have available a new motion picture and a booklet (soon off the press), both on *"Stainless Steel Welding."* Also for your production men, a complete *"Handbook of Special Steels."* For your engineers, certified *"Blue Sheets"* on each tool and stainless grade. For your apprentice or training courses, *"Elementary Discussions on Tool and Stainless Steels."*

● Write for the informational help you need. In addition, the personal assistance of our Technical Staff is at your call.

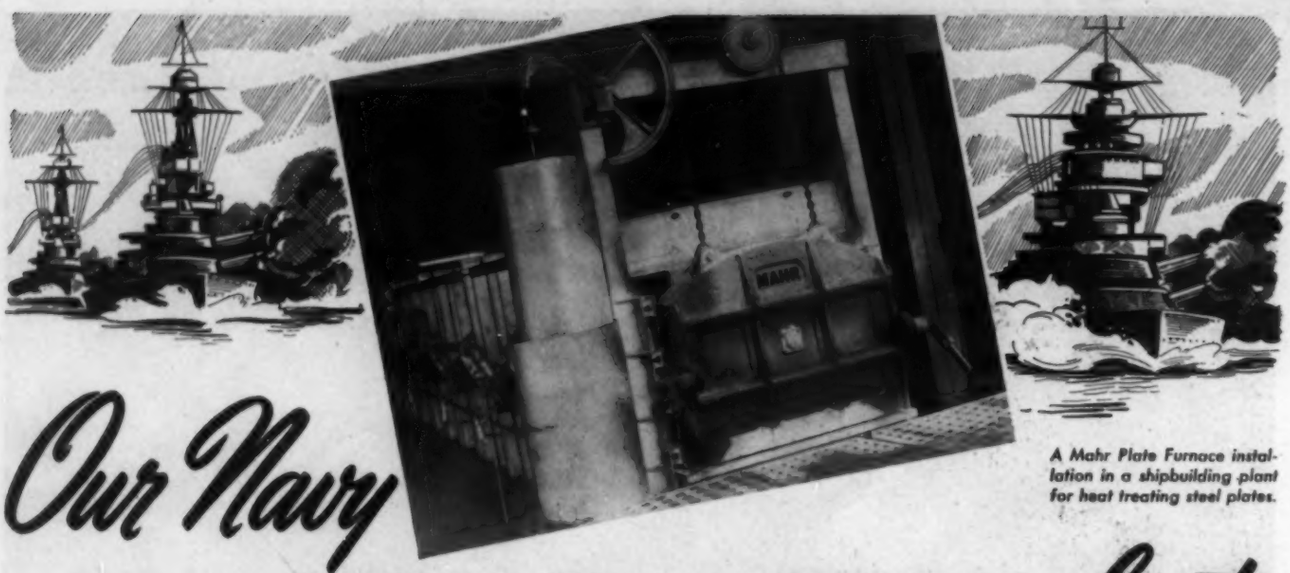
PRODUCING constantly improved war goods at a diminishing rate of cost, and an increasing rate of speed, ordinarily wouldn't be much of a trick for America. It's right up our industrial alley.

But conditions today are not as usual. There is no inexhaustible ocean of materials. There is, instead, a controlled stream flowing through rigidly restricted channels. We have to do *more*, actually, with *less*.

Thrift is especially essential with the vital steel alloys. If you use alloy steels in *any* form, check your dies, your cutting tools and machine set-ups, your heat-treat and welding methods—check and recheck every operation to reduce rejects, spoilage, undue scrap, or any other form of waste. Above all, carefully segregate and classify your unavoidable alloy steel scrap (*that is the only way the mills can reclaim it*) and rush it back into the useful cycle.

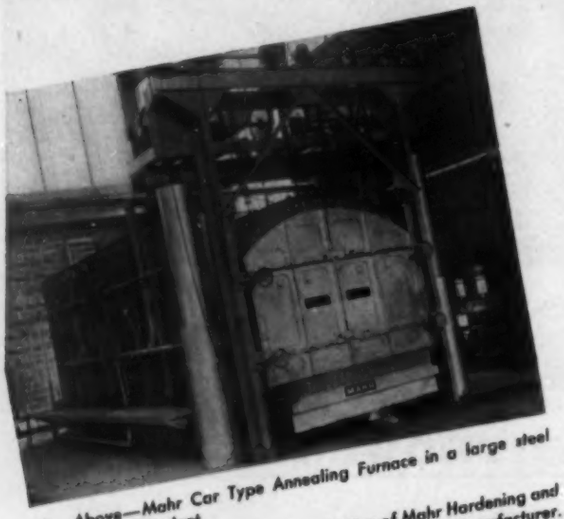
Allegheny Ludlum
STEEL CORPORATION
GENERAL OFFICES: PITTSBURGH, PENNSYLVANIA

A-8665 . . . W & D



A Mahr Plate Furnace installation in a shipbuilding plant for heat treating steel plates.

Our Navy GIVES 'EM "HEAT TREATMENTS" plenty



Above—Mahr Car Type Annealing Furnace in a large steel company's plant.

Below—Two views showing installation of Mahr Hardening and Drawing Furnaces in the plant of a large tool manufacturer.

On the seas, it's our armor plate versus bombs, shells, torpedoes—and vice versa! Our Navy is manned by men of courage, high morale, GUTS! They deserve the toughest armor plate (and the best arms and shells) in the world—and they're getting them.

We like to feel we're really giving the Japs "heat treatments", with hundreds of MAHR Furnaces in use 24 hours a day, carburizing armor plate for greatest strength and toughness—and with many other kinds of accurate heat treatments helping to perfect every type of steel needed on America's warships . . . The modern science of heat treating metals is receiving its fullest expression and creative development in

MAHR FURNACES

FOR EVERY HEAT TREATING NEED

	Furnace Types:	*Other MAHR Equipment:*
ANNEALING	CAR BOTTOM	RIVET FORGES
CARBURIZING	PIT	TORCHES
BAKING	PUSHER	BURNERS
HARDENING	ROLLER HEARTH	BLOWERS
FORGING	CONTINUOUS	VALVES
DRAWING	POT	SMITHING FORGES
STRESS RELIEF	ROTARY	

Call in a MAHR Engineer — he can help you on any heat treating problem . . . Wire, write, or phone today.

MAHR MANUFACTURING CO.
DIV. DIAMOND IRON WORKS, INC.
GENERAL OFFICES—MINNEAPOLIS, MINN.
SALES OFFICES IN PRINCIPAL CITIES

Save ALL your scrap!

Buy MORE War Bonds!

Advertisement OCTOBER, 1942

COPPER ALLOY BULLETIN

REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

Prepared Each Month by the Bridgeport Brass Co. "Bridgeport" *Headquarters for BRASS, BRONZE and COPPER*

Brass Is Adaptable to a Wide Range Of Fabrication and Service Needs

Desired Properties Can Easily Be Obtained by Small Changes in Composition and Proper Working

Brass is one of the most useful of all engineering materials because it has a broad range of physical properties which can easily be controlled to meet many service requirements and which are adaptable to practically any type of fabrication. These properties can be controlled by changing the copper-zinc ratio, by adding other elements, and/or by mechanical means.

Single and Two-phase Alloys

As a fabricating guide, the brasses can be broken down into two groups: (1) the alpha brasses, which have a copper content of 64% or more and form a solid ductile solution at room temperature thus making them easy to cold work, and (2) alloys of lesser copper content, which are known as two-phase alloys, because they form a second solid solution which is appreciably less ductile at room temperature and therefore less suitable for cold working. However, the two-phase alloys have excellent hot working properties because the second, or beta, solution is soft and plastic at elevated temperatures.

The straight copper-zinc series of brasses range in copper content from about 95% to 56%. In general, it may be said that strength and hardness increase as zinc is added. The changes in physical properties are not uniform, however, and there is not a proportional relation between zinc content and physical properties.

Choosing an Alpha Brass

The choice of an alpha brass often depends upon a compromise between ductility and cost. The least expensive of these alloys is Common High Brass, an alloy with the lowest copper content (64%) of those which contain simply the ductile alpha solution. This alloy finds wide application for electrical fittings and small parts, such as screws and rivets. When the copper content of brass reaches 70%, an alloy combining strength and ductility is achieved that can be used for such deep drawing operations as the fabrication of cartridge cases. For this reason, 70-30 brass is generally known as Cartridge Brass. The accompanying graphs show how this alloy reacts to drawing and annealing.

Among the other widely used brasses of high copper content are the following: Gilding Metal (95-5), an alloy not much stronger than copper but very ductile and easily worked both hot and cold; Commercial Bronze (90-10), favored for its rich "bronze" color and comparatively high melting point; Rich Low, or Red Brass (85-15), noted for excellent resistance to failure by season cracking and dezincification; and Low Brass (80-20), an intermediate alloy limited largely to applications which require maximum strength and reasonable freedom from season cracking.

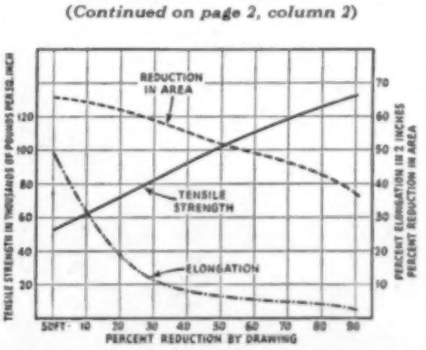
The most commonly used two-phase brass is an alloy of approximately 60% copper and 40% zinc known as Muntz Metal which has excellent hot working properties under most conditions. As might be expected, however, it is somewhat harder and less ductile at room temperature than most of the other copper-zinc alloys. Other properties of Muntz Metal include resistance to failure by season cracking or stress corrosion equal to that of regular high brass, fairly good resistance to attack by sulphur compounds, and low cost. This alloy should not be used where conditions favorable to dezincification are present.

Modifying Elements

A third or fourth element is added to copper-zinc alloys when some specific improvement is desired. By far the most important of such elements is lead because it imparts machineability. Unfortunately, the addition of lead makes it difficult to hot work alloys with copper contents above 63% and also makes them sensitive to processing variables in cold working. Therefore the use of lead in brass is largely confined to alloys in which the copper content is in the 55-63% range, such as Screw Machine Rod, Leaded Cold Heading Rod, Forging Rod, Leaded Naval Brass and Clock Brass.

The addition of about 1% silicon to Common High Brass will change it from an alpha solid solution alloy to a two-phase alloy very similar in structure and physical properties to Muntz Metal. Such an addition therefore makes it possible to hot work an alloy of

(Continued on page 2, column 2)



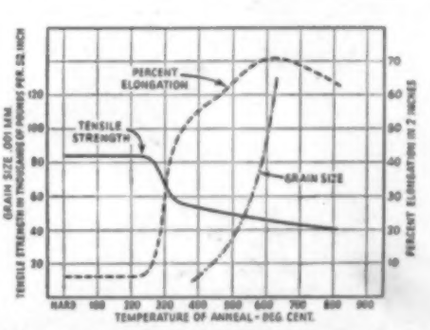
Effect of Cold Drawing on Mechanical Properties of 70-30 Brass Rod or Wire.

Copper Alloys Found Superior For Use In Photographic Parts

"After more than thirty years experience in the manufacture, research and engineering of our products, we have concluded that copper base alloys are more suitable to our products than other types of metals," it is stated by the Ilex Optical Company, of Rochester, N. Y., makers of photographic equipment. Machineability, stability and durability are the reasons given by the company for the almost exclusive use of copper alloys in the production of metal parts for their products.

Sheet brass, leaded brass tubing and brass rod are normally used by the Ilex Optical Company in the production of lenses, shutters, mountings and housings. Brass rod or

brass tubing, for example, is used for lens cells, while thin gage rich-low brass sheet approximately 6 numbers hard is used for the leaves in the diaphragms of lens barrels. Such parts of photographic shutters as the housings, levers and face plates are made of either bronze castings or brass sheet. Likewise all small screw machine parts, such as screws, rivets, axles, posts and pivots, are formed from bronze or brass rod.



Effect of Annealing on Mechanical Properties of 70-30 Brass Sheet.

COPPER ALLOY BULLETIN

ALLOYS OF COPPER

This the is thirty-eighth of a series of articles on the properties and uses of the copper alloys.

COPPER ALLOYS FOR CATENARY CONSTRUCTION PHONO HIGH STRENGTH No. 813

The catenary supporting wires, or messengers, on early electrified railroad systems were made of steel. Since the problem of corrosion was a serious one, Bridgeport Brass Company, about 20 years ago, undertook the development of a high strength corrosion resistant copper alloy wire which was designated as Phono High Strength. This alloy contains approximately 97.60% copper, 1.40% tin and 1% silicon. It has an electrical conductivity of about 13% as compared to copper. Its physical properties follow:

Specific Gravity, Hard Drawn	8.78
Wt. lbs./cu. in.	.3172
Wt. lbs./circ. mil. ft.	0.000002989
Min. elec. cond. I.A.C.S.	13%
Max. elec. res.	
Ohms/circ. mil. ft.	79.78
Coef. of line. expansion/°F.	0.0000094
Thermal con. (approx. % cop.)	20%
Tensile Strength, lbs./sq. in.	
Hard Drawn	70-135,000
Annealed	43-50,000
% Elon. in 60" Hd. Dr. Wire.	0.85-1.50
% Elon. in 10" Hd. Dr. Rod	1.75-10.0
% Elon. in 2" Hd. Dr. Wire	5.0-20.0
% Elon. in 2" Annealed Wire	40.0-60.0
% Reduc. in Area Hd. Dr. Wire	50-80
% Red. in Area Annealed Wire	75-85
Johnson's El. Li., (%T.S.)	
Hd. Dr.	60-75
Modulus of Elasticity	15,000,000
Magnetic Properties	Non Mag.

In electrified steam railway construction, the entire overhead is stranded wire except for contact and possibly auxiliary wire. The messenger wires are live wires; consequently, electrical conductivity is very important. When higher conductivity than 13% is desired, the stranded cable is made up of a combination of Phono High Strength and hard drawn copper wires with consequent loss in strength.

Because of its fine properties—high strength, resistance to corrosion from the elements, great toughness, and good workability—Phono High Strength was soon adopted for the manufacture of pole line and signal hardware, wire clamps, U bolts, machine, wood and cap screws, nuts, lockwashers, water meter parts, and marine hardware. Such items are generally made from hard drawn wire which is not only very strong but remarkably malleable.

Brass Is Adaptable

(Continued from page 1, column 3)

practically the same composition as Common High Brass, yet with properties similar to Muntz Metal. The addition of silicon also makes it possible to spot weld an alloy of more than 80% copper as it lowers thermal and electrical conductivity.

Tin, when added to copper-zinc alloys, reduces corrosion (particularly from sea water) by retarding dezincification. It also adds strength and makes the polished metal lighter in color. The substitution of 1% of tin for a corresponding amount of zinc in Cartridge Brass, for example, produces an alloy suitable for condenser tubing which is

Part of the complete equipment in Bridgeport's Research Laboratory for the study of copper and copper alloys is this apparatus with which the arsenic content of brass is determined, in order to evaluate its effect.

known as Admiralty Metal. Further steps are taken to prevent dezincification of Admiralty Metal by the addition of Arsenic, antimony and phosphorus. Aluminum increases the corrosion resistance of copper-zinc alloys but for a different reason. It forms a strong oxide film which increases the protective film normally formed on brass thus making the metal more resistant to erosion and subsequent corrosion. Another property of aluminum is to raise the tensile strength of brass as it does in high strength manganese bronzes.

In addition to the methods mentioned, the physical properties of brass can also be altered by suitable processing. Strength, stiffness and spring properties can be improved by cold rolling or drawing and ductility increased by annealing or heat treatment. In the soft condition, for example, brasses range from 45,000 to 65,000 pounds per square inch in tensile strength while they may range from 65,000 to 100,000 when cold worked.

Today when quality is so vital and metals so scarce, both the selection of the *best* brass for any particular application and its proper fabrication are of special importance. Bridgeport's laboratory technicians will be glad to advise fabricators on these problems.

NEW DEVELOPMENTS

A precision inspection instrument is announced which is described as a visual indicator comparator gage designed especially to facilitate inspection of close tolerance parts. It has built-in limit indicators to copy the range of tolerance from master parts and is said to multiply dimensions by as much as 200. It is adjustable for use on snap gaging operations or with built-in button retractor, for gaging plunger. **(No. 370)**

A colorless liquid leak sealer is announced as offering a quick way to stop leaks in concrete walls, tunnels, floors, tanks and pits. It is mixed with ordinary cement and molded into a carrot that can be forced into the opening. This sealer is said to stop leaks immediately even against intense pressure. **(No. 371)**

A heavy-duty non-skid C-clamp has been placed on the market. The screw is provided at the clamping tip with a bronze bushing which is designed to prevent galling and provide free movement, so that slippage on work is eliminated. **(No. 372)**

A coupling head thermo-switch has been designed for insertion into a closed liquid or gas system by means of a half-inch standard pipe thread. It has a brass shell and is available in models with contacts which open on increases and decreases in temperature. The adjustable operating range is 50 to 400° F. Contacts are rated at 10 amp at 115 v and 5 amp at 230 v. This unit is also available with 25 amp capacity and can be furnished for operation up to 600° F. **(No. 373)**

A metal parts washer is announced which is said to be adaptable for cleaning war production parts, shell cartridges and munitions parts. It offers a long dormant soak besides the customary method of powerful hydro washing. The unit can be used for soaking, washing, drying and the preparation of metal parts either machined, or rough, and for complete assemblies. **(No. 374)**

An acid and alkali resistant paint is offered made from domestic waxes in Indian red color. It is said to dry very quickly allowing several coats to be applied in a day. The maker says it requires no priming coat and will adhere to iron, steel, non-ferrous metals, wood, stone and cement. **(No. 375)**

A tube cutting attachment is offered which can be adapted to all sizes of nibblers and is said to save hours of time. The cutting speed is about 36 inches per minute. Set-up time, it is claimed, can be reduced over normal methods and nibbling does not require a skilled operator. The use of a standard punch is said to keep tool cost to a minimum. **(No. 376)**

This column lists items manufactured or developed by many different sources. Further information on any of them may be obtained by writing Bridgeport Brass Company, which will gladly refer readers to the manufacturer or other source.

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Executive Offices: BRIDGEPORT, CONN.—Branch Offices and Warehouses in Principal Cities

SHEETS, ROLLS, STRIPS—*Brass, bronze, copper, Duronze,* for stamping, deep drawing, forming and spinning.

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*Trade-name.

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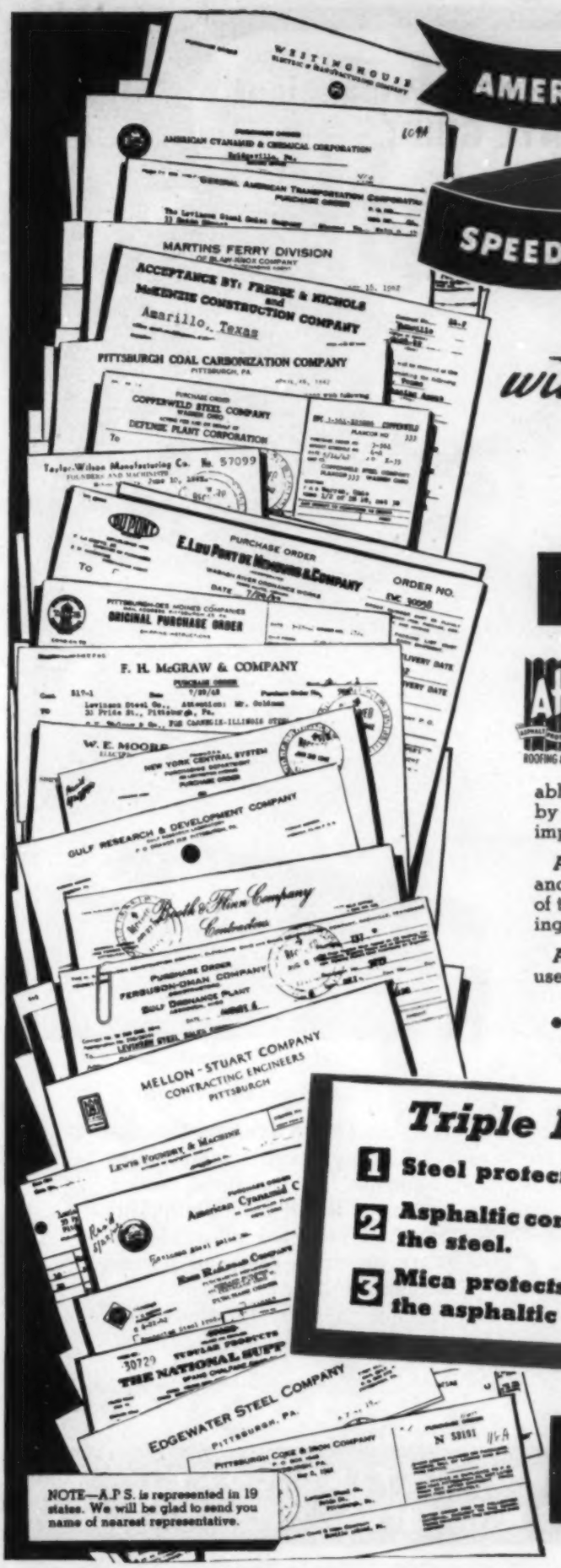
BRASS, BRONZE, DURONZE WIRE—For cap and machine screws, wood screws, rivets, bolts, nuts.

FABRICATING SERVICE DEPT.—Engineering staff, special equipment for making parts or complete items.

BRASS AND COPPER PIPE—"Plumrite"* for plumbing, underground and industrial services.

Note: Bridgeport products are supplied in accordance with existing priority regulations.

BRIDGEPORT BRASS



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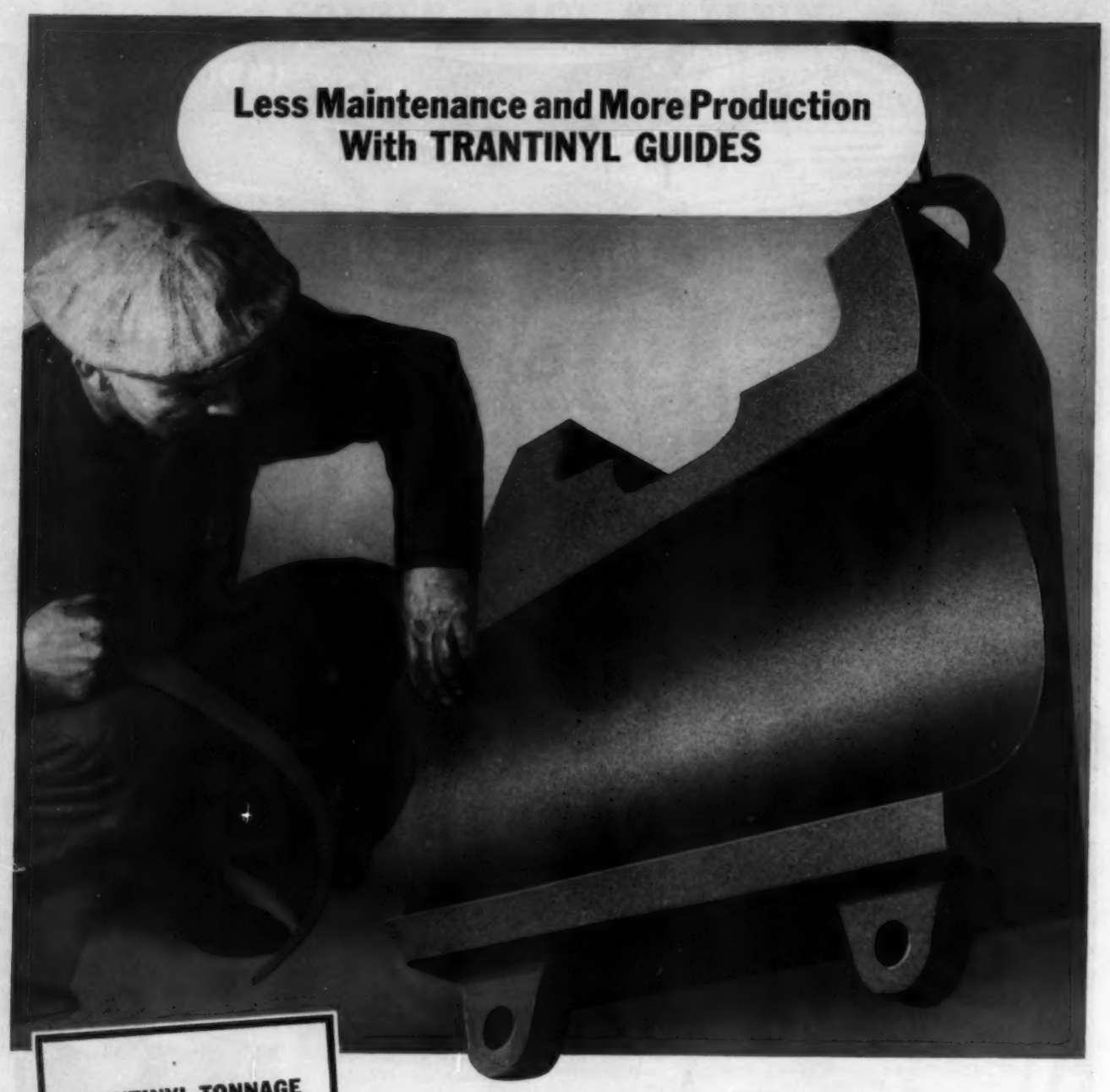

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Seamless Tube: Guide Shoes, Rolling Mill Plugs, Stripper Guides. **Bar Mills:** Guides, Rollers. **Hoop Mills:** Slitter Guides, Feed Rollers. **Billet Mills:** Rollers Guides. **Strip Mills:** Guides, Uncoiler Wearing Plates (Cold Strip). **Shape Mills:** Rollers, Guides. **Welded Pipe:** Rolls.

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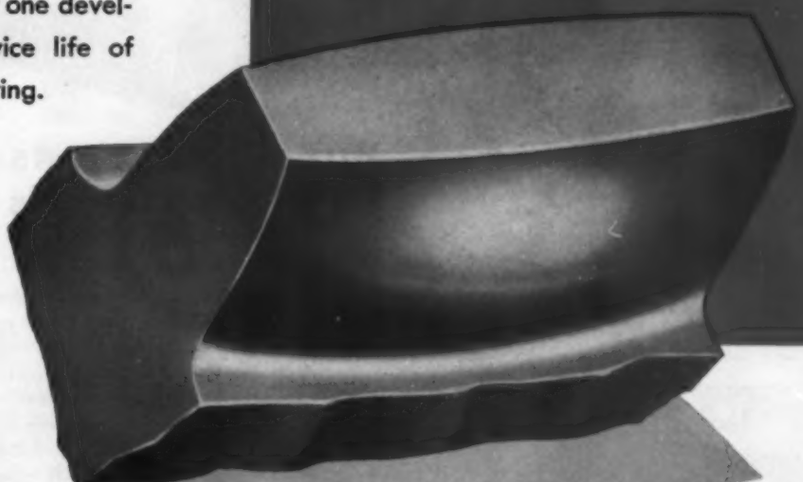

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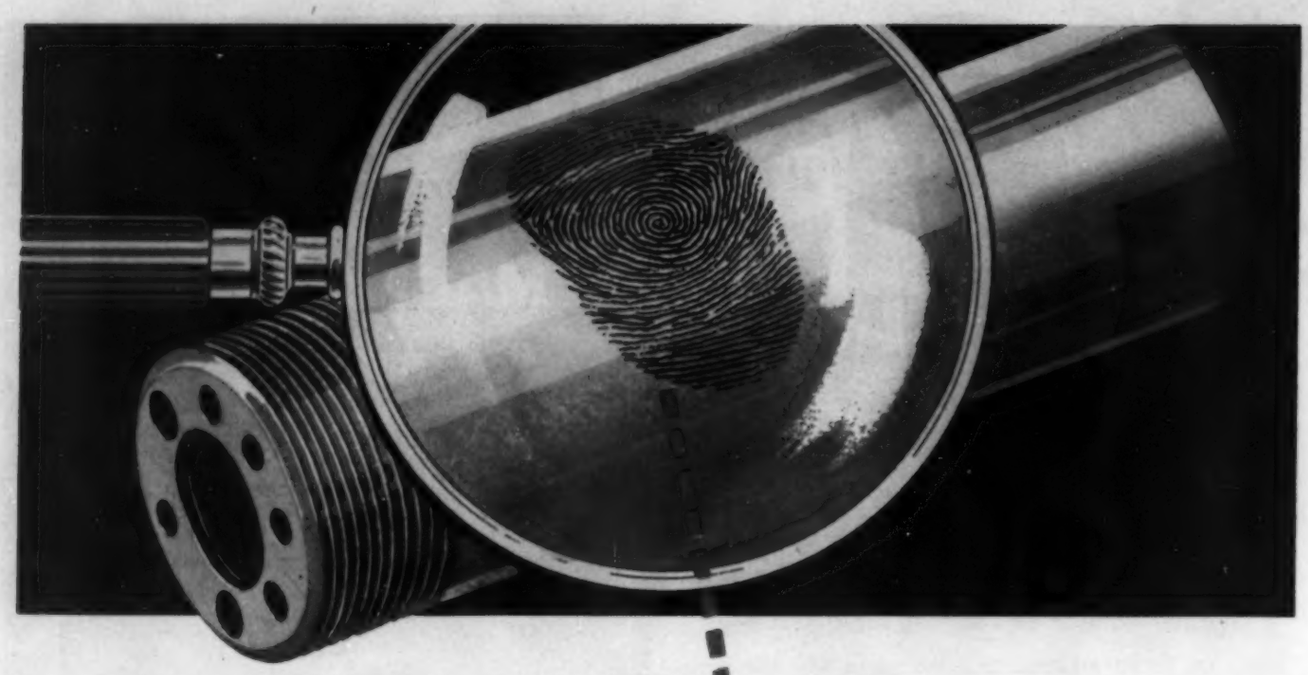

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. . . blossom into ruinous rust!

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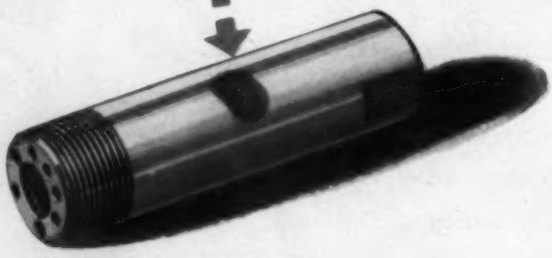
• Bar stock, machinery, also metal structures can be kept rust-free by applying NO-OX-ID.



But when parts are treated with NO-OX-ID, rust is "nipped in the bud"

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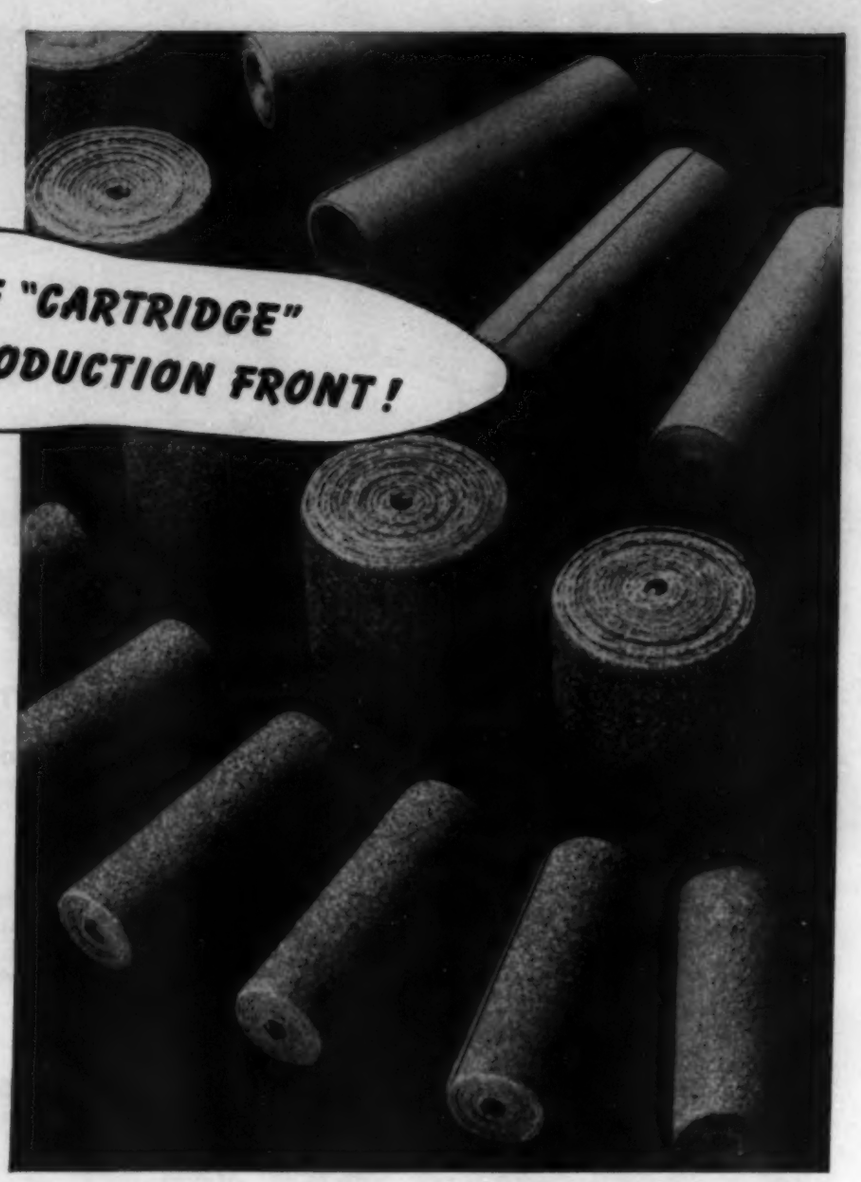

NEVER before has the metal working industry been called upon to grind, finish or polish such a bewildering variety of parts, fittings and finished products. And never before has there been such a demand for improved metal finishing techniques.

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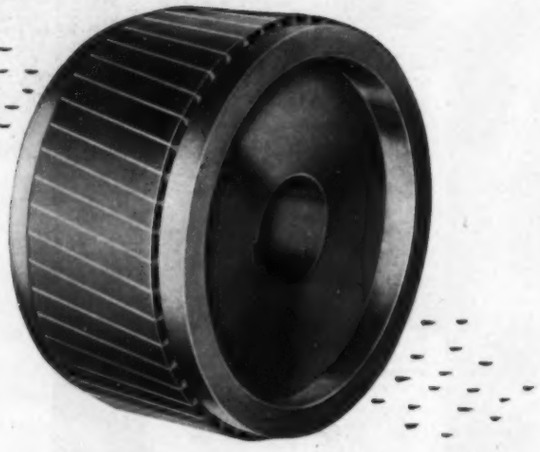

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Copperspun

FAIRBANKS-MORSE F M **MOTORS** *DIESELS SCALES PUMPS*

Critical alloys are being reduced in light armor steels for American fighting machines, p. 172

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Published by The Penton Publishing Co., Penton Building, Cleveland, Ohio. E. L. Shaner, President and Treasurer; G. O. Hays, Vice President; F. G. Steinebach, Secretary.

Member, Audit Bureau of Circulations; Associated Business Papers, Inc., and National Publishers' Association.

Published every Monday. Subscription in the United States and possessions, Canada, Mexico, Cuba, Central and South America, one year $6; two years $10; all other countries, one year $12. Single copies (current issues) 25c.

Entered as second class matter at the postoffice at Cleveland, under the Act of March 3, 1879. Copyright 1942 by the Penton Publishing Co.

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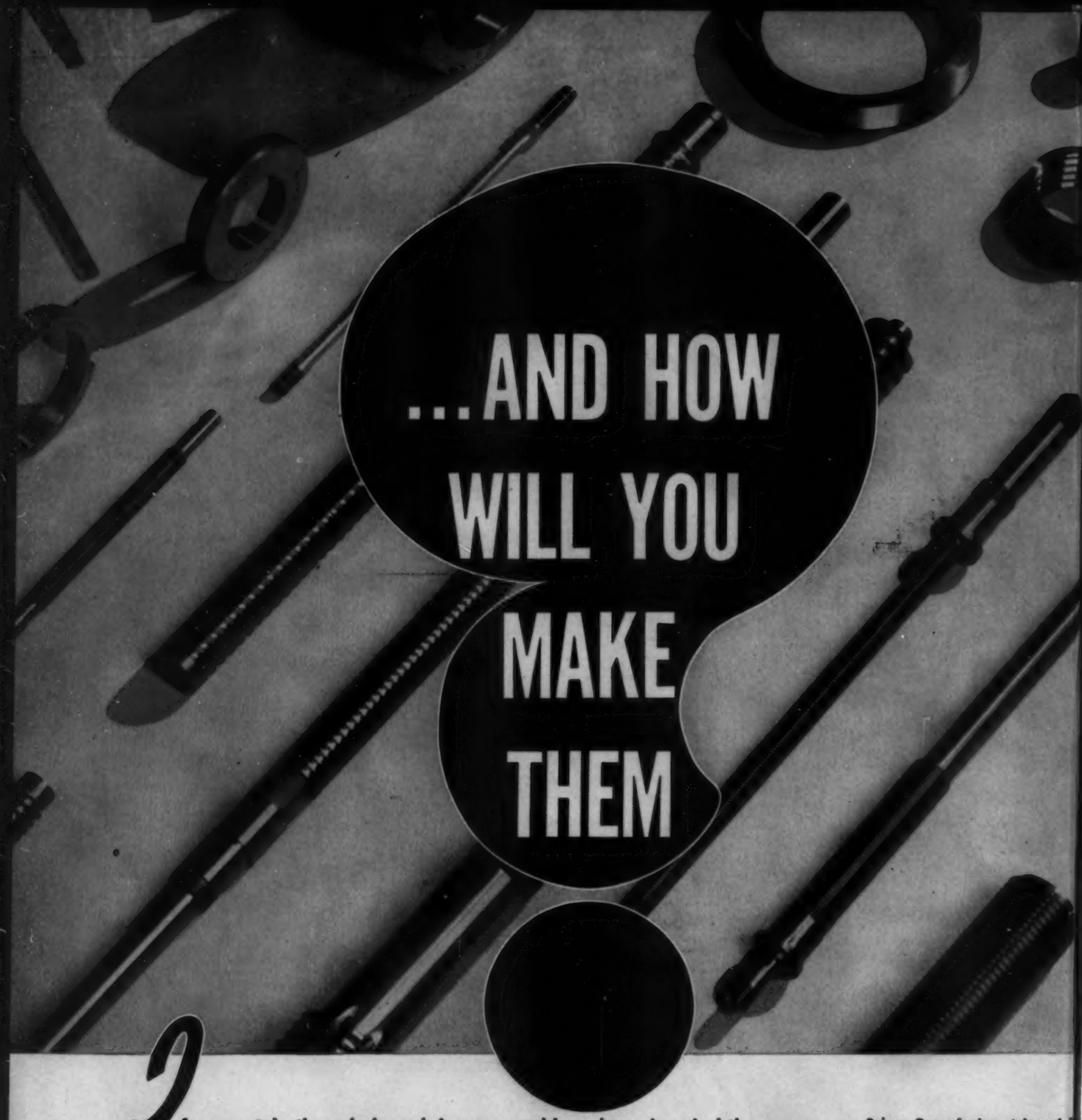

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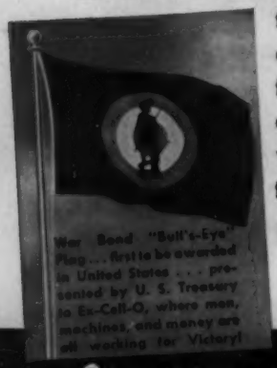

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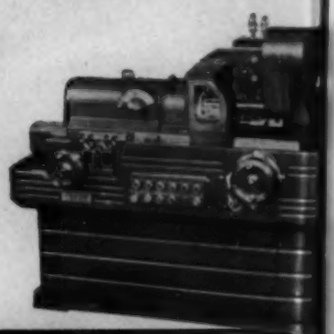

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EX-CELL-O means PRECIS

HIGHLIGHTING

this issue of STEEL

METAL SHOW This year's National Metals Congress and Exposition, to be held in Cleveland, Oct. 12-16, is to be focused on producing for war. The discussions will break down into group meetings and papers (pp. 209-220) concerned with conservation, salvage, employe training, effective use of materials. Representatives of the armed forces will be present to acquaint industry more fully with the nature of the military requirements and the problems attendant upon production. The exhibits, too, will be in harmony with the wartime emergency (pp. 223-232). Those in the metals industries who can be spared from their work are urged to attend (p. 93).

SMALLER BUSINESS Donald M. Nelson last week recommended at a Senate committee hearing the creation of a War Liabilities Adjustment Board to facilitate use of productive plants during the war and to assure to small business enterprises the opportunity to re-enter the competitive economy after the war. The recommendation also would cover methods for keeping the financial position of smaller companies sound (p. 95). In the meantime the Smaller War Plants Division of the War Production Board reports some progress in providing war work for small plants (p. 294).

LEAN TIMES AHEAD An analysis of present trends supports Washington warnings that tough times lie ahead (p. 104). Manufacturers not producing something that is shot at the enemy will do well to examine the newly developing phase and plan accordingly. Ahead are shortages of manpower, food, textiles, wood and others still to be revealed.

TECHNICAL Paul G. McKimm concludes his discussion on the heterogeneity of steel ingots (p. 130) in the last of his series of articles on the manufacture of high-quality, low-cost steel.

Mass production methods developed by the Mccord Radiator & Mfg. Co. in manufacturing the new combat helmet are described (p. 122). Operations involved include stamping, forming, welding and painting.

Denys Val Baker describes British air raid protection methods and how air raids are prevented from seriously hampering production (p. 128).

Electric motor maintenance is a "must" today (p. 124). O. F. Vea describes methods. . .Tom Marney writes about crane protection methods (p. 135).

B. L. Wise describes some important applications of resistance welding in ordnance work (p. 184).

MATERIALS The Army Ordnance Department has helped to stretch out our supply of critical materials through methods of design, through substitutions and through manufacturing procedures. Prof. A. F. Macconochie tells details (p. 153). Prof. Macconochie also discusses our copper resources and what is being done by the Ordnance Department to conserve copper (p. 194). These are the first of a series of articles, the remainder to appear in future issues.

H. G. Batcheller explains workings of a new system of issuing steel production directives; it is leading to increased production (p. 108). Consumers will be asked to use less high-molybdenum tool steel. A further cut in use of tin will be ordered (p. 109). Control of copper exports has been clarified.

Because of the shortage of high-grade iron ore for open-hearth furnaces Canada's move to develop the Steel Rock deposit is important news (p. 286), Plan calls for a new ore dock at Port Arthur. Follansbee Steel Corp. is producing electric furnace quality alloy steels in open-hearth furnaces (p. 288). An Acid Open Hearth Research Association has been organized (p. 289). Control over Lake shipping will be more stringent (p. 295).

Results of the first few days of the national scrap drive have exceeded expectations (p. 94). Reclamation of idle mining machinery is complicated by the shortage of repair parts for mining machinery (p. 114).

A new vertical system of materials control is to supplement the present priority system. Production Requirements Plan will be used only to care for requirements of manufacturers of valves, bearings and other products which must be on shelves all over the country so that manufacturers of various end products can get them when needed. (p. 109).

Copper scrap, copper-base alloy scrap and ingots will be available to foundries only on A-1-a or higher priority ratings (p. 102).

IT'S A LONG WAY.

from RAW STEEL *to the* BATTLE LINES!

But Ryerson Cuts the Corners

IT'S a long way from raw steel to finished tools of war—from plates, structurals, bars and sheets—to planes, tanks, ships and guns! Helping to keep steel moving quickly and smoothly to all of the thousands of operations that must come *ahead* of final assembly is Ryerson's part in the war production job.

Ten big Ryerson Steel-Service Plants, conveniently located to serve the nation, provide a reliable source for emergency steel — quickly available to keep arteries of war production flowing. This is the vital function these steel warehouses are performing.

And, in spite of today's emergencies, when required stocks are not always immediately available, Ryerson engineers, laboratory technicians, and steel-service men usually find a way to supply industry's war needs. Time and again, Ryerson stocks and Ryerson ingenuity, have been able to supply steel vital to the steady flow of war production when at first it seemed impossible.

Whatever your steel requirements — in line with the WPB system—the experience and resources of this century-young steel-service organization are yours to command. Phone, wire or write to the nearest Ryerson plant. You'll get quick action at once. Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON STEEL-SERVICE

STEEL
October 5, 1942

Metals and the War

The Nov. 14, 1918, issue of Iron Trade Review, predecessor of STEEL, while devoted chiefly to the effect of the recently signed armistice upon American industry, also carried a brief item stating that the American Steel Treaters' Society had been formed to "promote the arts and sciences connected with the heat treatment of steel." A year later, this young organization, which meanwhile had established nine local chapters, held its first convention and exhibition in Chicago. Sixty-four manufacturers displayed their wares in the Seventh Regiment armory.

During the ensuing years this society, which was born in the crucible of World War I, changed its name, broadened the scope of its activities, increased its membership and greatly improved its service to industry. Today as the American Society for Metals, it is a vigorous organization wielding a powerful constructive influence in the important field of metals.

In Cleveland, Oct. 12-16, A.S.M. will hold its twenty-fourth annual National Metal Congress and War Production Edition of the National Metal Exposition. It will be the first the society has sponsored when the nation was at war. As usual the American Welding Society, American Institute of Mining and Metallurgical Engineers and the Wire Association will participate. More than 250 exhibitors will display metals, equipment, supplies and services.

This year the sole objective of the event is to increase production for war. Many technical sessions dealing with specific problems of production have been scheduled. Numerous government officials will participate with the leading technicians of the metals industries in discussing these problems.

Those who can spare time from the production front to attend the congress and show undoubtedly will be rewarded handsomely. They can obtain in a compact package ideas and information which could not be gained otherwise except at the expense of time-consuming travel and investigation.

E. L. Shaner

Editor-in-Chief

Industrial Campaign Under Way Throughout Nation

Seventy thousand plants asked to search for material; discarded metal from households, mixed with rubber, piled high on corner lots presents problem in collection

DETROIT

LAUNCHING of the nation-wide industrial "dormant" scrap drive over the next 90 days was announced here last Wednesday by Hamilton W. Wright, chief of the Industrial Salvage Section, Conservation Division, WPB, at a conference of 175 automotive salvage officials.

The campaign will include three successive letters addressed to presidents of 70,000 industrial plants, asking managements to inspect their plant properties thoroughly with a view to listing all dormant scrap items and making disposition against this list by Dec. 31.

These letters will be followed by visits to all the plants by the field organization of 140 of the industrial salvage section, with the assistance of 2000 volunteer assistants recruited from steel companies, the American Steel Warehouse Association and the National Federation of Sales Executives.

Dormant scrap is defined as obsolete machinery, tools, equipment, dies, jigs, fixtures, etc., which are incapable of current or future use in the war production effort because they are broken, worn out, unrepairable, dismantled, or in need of unavailable parts necessary to practical re-employment.

Field Men's Purpose

Function of field men and volunteer assistants making calls on industrial companies will be threefold—to help in doubtful cases in the prompt identification of dormant scrap items, to assist in facilitating the disposition of dormant scrap by using all available and pertinent plant manpower, and to obtain reports of approximate dormant scrap tonnage moved within any 30-day period.

Mr. Wright pointed out in his discussion of the drive that between July 1 and Dec. 31 America must collect and move to steel mills 17,000,000 tons of iron and steel scrap, this amount or more being necessary to support the monthly consumption rate of 2,250,000 tons and leave 7,000,000 tons as a balance for steel mill yards on Jan. 1, to carry production through the winter months.

Industrial leaders heading up the special dormant scrap drive include George Rose, secretary of the Salvage Committee of the American Iron and Steel Institute; Walter S. Doxsey, president, American Steel Warehouse Association; C. F. Winchester, executive secretary of Associated Equipment Distributors, and H. R. Doughty, director of field operations on salvage for the National Federation of Sales Executives.

Mr. Doxsey said the warehouse effort will be under leadership of J. J. Hill Jr., Hill-Chase Co., Philadelphia, who has been named chairman of a committee which will include C. E. S. Dickerson, Edgar T. Ward's Sons Co., Pittsburgh; L. R. Moise, Moise Steel Co., Milwaukee, and J. Frederick Rogers, Beals, McCarthy & Rogers Inc., Buffalo.

Meetings of warehouse salesmen in the 19 cities where there are association chapters will be held in co-operation with the regional chiefs of WPB's Industrial Salvage Section.

PHILADELPHIA

Results of the first few days of the popularized national scrap drive have exceeded general expectations, according to reports here late last week.

Scrap from every conceivable source—much of it collected by school children in a fervor of patriotism—is piled high in countless number of places, and its collection now has become a problem.

Here in Philadelphia in addition to a sharp increase in salvage from industrial plants, more than 7500 tons of household scrap was weighed within five days. By end of last week it was estimated 10,000 to 12,000 tons of household scrap would be accounted for. This special drive will continue two more weeks. Meanwhile, plans are being laid for a still more intensive search for industrial

HIGH above Broadway and Seventy-third street in New York, workmen last week were removing one of the cornices which has adorned the Ansonia hotel for many years. Reason is to obtain the copper it contains for use in the war effort. NEA photo

scrap. Steel producers' district sales executives held an organization meeting last Thursday. They elected H. E. Richardson, Youngstown Sheet & Tube Co., chairman, and H. C. Husted, Bethlehem Steel Co., vice chairman. WPB representatives outlined objectives. Another meeting later in the week was to be attended by salesmen as well as executives, 80 in all scheduled to be present.

Details of procedure will be worked out, salesmen assigned to visit companies in an effort to develop a still greater amount of salvage material. District steel warehouse salesmen also are being organized. The area as now set up includes eastern Pennsylvania, Delaware, Maryland and Virginia.

The rapid accumulation of household scrap here and elsewhere is presenting a serious task for dealers in handling, processing and evaluating it. The scrap contains a vast assortment of items, and while the drive is primarily for ferrous material, accumulations include other metals and rubber and even rubbish.

The question of price must be settled quickly to expedite the movement to the yards. In some of the smaller communities price formulas have been worked out. For instance, in Reading, Pa., accumulations have been appraised by a disinterested expert, with price per ton set up on a basis of 96½ per cent ferrous scrap for which the dealers will pay a flat price of 50 cents per 100 pounds; 1½ per cent rubber, for which they will pay 1 cent per pound, and 2 per cent metal for which 2¼ cents per pound will be the price.

According to competent observers, accumulations of household ferrous metal here so far run about 90 per cent light scrap, which must be pressed, and galvanized material. This poses a problem at the moment for the yards, as in 20 in the city proper only eight have pressing equipment, 11 presses in all.

Moreover, all yards are short of men as they have lost heavily to the shipyards and other war industries which pay higher wages.

Incidentally, the surprising outpouring of scrap at this time causes some to speculate as to how much of it might have been available sooner if ceiling prices had been set at levels which would have encouraged collections. In other words, considerable scrap has laid dormant. There is little doubt but that a substantial portion of the scrap now being dumped on city lots by individuals would have been brought out earlier through normal routine channels if the venture had been made reasonably profitable to those in the business.

(For earlier news of the scrap drive, see pages 114 and 115).

War Liabilities Board Proposed by Nelson To Facilitate Use of Plants

CREATION of a War Liabilities Adjustment Board to facilitate the use of all productive plants during the war and to assure small business enterprises the opportunity to re-enter a competitive economy after the war ends was suggested last week by WPB Chairman Donald M. Nelson. The proposal was made to a special Senate committee to study the problems of small business.

The problem long has been a. tough one for the War Production Board—and a still tougher one for the small businesses. Numerous plans and efforts to ease the situation have been made by the WPB and other government agencies, through subcontracting programs and other devices, but none, it was said, has alleviated the difficulty.

Subcontracting efforts were satisfactory in many instances in increasing war production but bogged down in solving the problems of many small companies which were unable either to enter war production or to obtain materials to continue their normal lines of goods.

Result has been that small shops unable to convert to war production and plants that have been converted in a manner which did not permit full use of facilities are confronted with extinction or extreme difficulty when the war ends.

Mr. Nelson said he would like the Senate committee to develop possibilities along the following lines:

1. To help small business enterprises adversely affected by the war take care in an orderly fashion of overhanging liabilities which under normal circumstances they would have been able to discharge.

2. To provide effective mechanism for financing small business after the war.

3. To provide effective means for giving small business technical and other assistance at the end of the war.

4. To provide a mechanism for giving to small business enterprises broken up by the war a priority in the acquisition of machinery and equipment when the war is over.

Needs of the war program, Mr. Nelson reiterated, will force the country "to

Small business must be protected from the dislocations caused by the war, Donald M. Nelson, WPB chairman, warned members of a special Senate committee to study the problem of small business last week. Mr. Nelson emphasized that the national problem is two-fold: Getting out the most war materials in the shortest possible time; and preserving small businesses adversely affected by the war. NEA photo

cut civilian production and civilian economy to the bone."

Before the war is over, he said, "we shall need to use in some way for essential purposes all the management ability we have, all the manpower we have, and all the materials we have."

For this reason, Mr. Nelson said, there should be no action by the government administrative agencies or by Congress that would tend to immobilize or freeze into a nonproductive state any of the elements of productive capacity—management, materials, labor, machinery, buildings or land.

Wherever possible, he said, war work will be taken to plants that now are in existence. He warned that in many cases it will be necessary to move both men and machinery to other places, but that in no case can useful equipment be allowed to remain idle until the war ends.

Machinery that cannot be put to use for essential purposes, he said, can be made a source for spare parts for machinery which is in use. Failing that, it will be used as scrap.

"The one thing we cannot do," Mr. Nelson told the Senate committee, "is to pack away permanently, in grease or in any other way, machinery and equipment against the end of the war."

"On the contrary, we must in some way know that every existing piece of machinery and equipment, regardless of whose hands it may be in, regardless of whether it is owned by a large corporation or a small shop, is available for use to win the war."

Need Government Help

Pointing out that it may not always be feasible to ask owners to care for machinery which is to be scrapped or dismantled, until such time as it is needed, Mr. Nelson said:

"We need, I believe, to begin setting up under the authority of the War Production Board an agency to buy and hold until needed machinery and equipment in the same way that we are now buying inventories of raw materials."

Making sure that full use is made of the nation's manpower is a joint responsibility of the War Production Board and the War Manpower Commission, Mr. Nelson said. It involves finding people, training or retraining both labor and management, and putting them in the right spots. For that reason, he said, he believed that the War Manpower Commission will institute a more intensive and extensive program for recruiting and retraining the proprietors and the workers of small business enterprises which cannot be employed in the war effort in their present concerns. Hence, he suggested, it may well prove desirable to use many of these smaller plants as training centers for practical production and management work.

Discussing his proposal for a War Liabilities Adjustment Board, Mr. Nelson said:

"As I see it, we are all vitally interested in providing for a sound economy when war is over. To me a sound economy calls for ample opportunity for small enterprises to enter particular fields and add their imagination, initiative and drive to the competitive struggle to provide more and better goods for all of us at continually lower prices. But to me this objective should not involve putting machinery or labor or management brains away in cold storage for the duration of the war."

Materials Requests Under PRP Cut Back To Match Supplies

PRODUCTION Requirements Plan will be modified in important respects for the first quarter of 1943 and completely revised for the second quarter, industries operating under the plan were advised last week. PRP will be retained only as a reporting system, to keep WPB advised of the movement of critical materials, it was said.

Authorizations to receive materials under PRP now are being returned to applicants, WPB Chairman Donald M. Nelson said last week. Original materials requests have been changed to conform with determinations of the WPB Requirements Committee.

PRP applications for the first quarter of 1943 have been approved and will be mailed out as soon as they are received in sufficient quantity from the printer. Schedule for the January-March quarter calls for receiving applications and returning the certificates to applicants before the beginning of the quarter.

Total raw material authorizations for military and nonmilitary production for the fourth quarter have been kept within the limits of estimated supply by the determinations of the Requirements Committee. This is the first time that such a balance has been accomplished in advance.

In adjusting requirements to match the available supply of materials it was necessary to cut back requests of companies under PRP from a moderate amount in the case of direct military items to a substantial amount in the case of less essential items.

All materials authorizations for the fourth quarter will be covered by preference ratings in the AA series. A new AA-5 rating has been established to be applied in certain instances.

All military items and many essential nonmilitary products already were covered by ratings of AA-1 through AA-4. Some of the nonmilitary items included among the quantity determinations of the Requirements Committee were not previously rated in the AA category. To uprate such items in the AA-4 category would place them in competition with military goods already in that class. To avoid this, the new AA-5 classification was established. It will include any remainder of the amounts on approved schedules to which the present PRP pattern ascribes a rating of lower than AA-4.

Average percentage of reductions or cutbacks in requests for authorizations cannot be reached because the factors in individual cases vary widely. Certain basic principles, however, were applied in all cutbacks. These included:

1. Total requests were kept within total supply.
2. End-use was considered so that items most urgently needed were provided for first, and received the least reduction.
3. Material inventory was considered so that reduction on requests was possible in cases where companies had sufficient stock in hand to permit such cuts.
4. Reductions in requests for other materials were considered in making final allocation of a particular material, so that each individual cut was as nearly as possible in proper proportion to the others.

Steel Requests Reduced

Carbon steel illustrates the problems encountered. When all requests were added, it was found that the needs of companies using this type of metal were estimated at 15,400,000 tons for the fourth quarter. This included the tonnage required by those under PRP and the amount set aside for use by consumers not under the system.

Estimated supply was only 11,100,000 tons. A reduction of 4,300,000 tons was necessary.

Requirements for all items made from carbon steel, therefore, were re-examined. Reductions were made first in items not intended for direct military use. Further reductions were made in co-operation with the armed services.

Structural Fabricators Shifted To War Work; 82% for Government

RESTRICTIONS on the use of steel for other than war purposes threaten to close down about one-half the fabricating structural steel capacity of the United States during the coming year. Many of the steel plants already have shifted over to the production of special products required by the Army and Navy.

This, in brief, was the report made to the twentieth annual convention of the American Institute of Steel Construction, Broadmoor hotel, Colorado Springs, Colo., Sept. 29-Oct. 2, by President Clyde C. Conley.

"All-out production for war must draft the brains and organization, as well as the equipment, of the shops fabricating structural steel," Mr. Conley said. "Prefabrication of structural parts has always speeded the construction of bridges and buildings. That technique has been widely extended to meet the needs of war. But the ability to produce, according to special plan and specification, anything made of iron or steel structural shapes and plates has proved of unique value in the war effort. This genius is available to develop new implements, make real the many new and startling ideas that the intense war effort requires and is constantly inventing.

"The same ability to fabricate steel to a plan and a specification is now being applied to a new job—to fabricate steel to a multiple of war uses, to supplement the production line to make "bits and pieces" that our arsenals and our factories may turn out more of everything. That is the job to which this industry is dedicated in the year ahead."

Mr. Conley pointed out that many new materials have been developed and substitute methods have been resorted to. These, he added, will not quietly withdraw at the end of the war and leave the markets to the older industries which formerly dominated them.

Smaller Tolerances Required

"Fabricators have been asked to make strange parts, often to a degree of accuracy that many of them had never attempted before. Government specifications demand small tolerances that may seem impossible of achievement. Plants have been forced to face the technical problem of tooling up, training new operators and retaining their old operatives. Government arsenals had, in the past, maintained some skeleton crews that were available to direct training programs in selected areas and some few fabricators had seemingly had the good fortune to have subcontracted a few articles with the arsenals. But the magnitude of war production was not foreseen and new production processes had to be worked out by industry itself.

"Shifts in structure of the economy during this war period will leave their mark. Whether the country will go into a great period of readjustment, rebuilding and expansion following the war, or into a long period of exhaustion and depression, we cannot tell, but we can be sure that the seeds of the future are now being broadcast.

"In no earlier war was the effort so great in the direction of building up production facilities; in no other war was the sheer magnitude of the expansion even thought of. The productive capacity of the steel industry alone has reached a point where the output can easily double the highest annual prewar consumption. In this war, it would seem, all industrial advances are being made during the years of the armed conflict. It was just the reverse during the previous World War. The advances in industrial productivity of that age came after the declaration of peace.

"In 1917-18 plant expansion was undertaken largely by private capital. For this war, plant expansion has been undertaken very largely by public capital. There is a strong possibility that private management may be compelled, in the years ahead, to share the management of industry, just as the government has already stepped in to share in the management of credit with the private banking system.

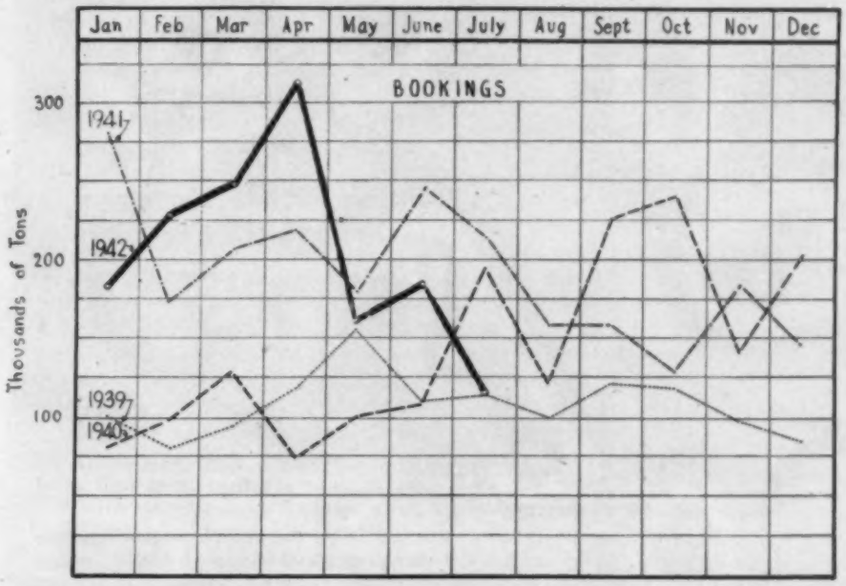
Must Develop Post-War Markets

"The war demands have induced an unprecedented economic change in our steel industry. By stimulating the demand for all steel products, it has brought about an expansion in the productive capacity beyond anything we would have otherwise contemplated. Fabricators and other consumers of steel will therefore find themselves pressed to develop post-war markets. These markets will be mostly domestic, for the war has also encouraged the building up of steel industries in countries never producing steel or which never produced steel in any appreciable quantity. Those previously backward producers will no longer be backward, and consequently we will be driven more and more to increase our own domestic consumption. . . .

"It will be a new world into which we will enter once this war is over, and in this new world we will have industrial problems which only industry can solve co-operatively."

Difficulties which the institute staff has encountered in attempting to obtain new war work for the industry were described by Robert T. Brooks, executive vice president. An impression prevails in government procurement agencies that the structural steel fabricating industry is specialized and concerned only with the building of structures. The impres-

(*Please turn to Page* 308)



Structural steel bookings have declined sharply this year since reaching a peak in April. August bookings of 73,541 tons, however, compare favorably with those of December, 1918, when war-time restrictions first went into effect

Steel Branch May Add "Labor" Man

WPB Chairman Donald M. Nelson last week said there is a "possibility of a labor man being appointed in the Steel Branch", as part of the overall program for giving labor greater representation in the functioning of the board.

A WPB labor-management committee is being lined up with one more man to pick, he said. Announcement of membership is expected soon.

Discussing the future of the Army-Navy Munitions Board, Mr. Nelson stated representatives of the services were moving into the branch to work with it on the steel program. He said ANMB will continue in existence because a certain amount of adjustments must be made between the services in directing the flow of materials.

War Bureau Heads Recommend Higher Wages in Metal Mines

Concern over the rapidly developing manpower shortage last week led representatives of the War Production Board, the War Manpower Commission and the Army, Navy and Maritime Commission to testify before the War Labor Board in favor of increased wages for copper, lead and zinc miners of the West as one way to guarantee continued production of these critical metals.

Their testimony was placed before the board as it considered whether to grant a $1-a-day increase to the 90,000 men of the industry, recommended by a majority of a mediation panel in an effort to attract back to the mines men who have migrated to better-paying jobs. The Mine, Mill and Smelter Workers union, CIO, acknowledged that wage increases since Jan. 1 have already boosted pay scales over 15 per cent, but William H. Davis, WLB chairman, asserted his board "is not going to tie its hands behind its back" by promising to freeze increases at the 15 per cent level.

$450,000,000 Higher Payroll Seen in Rail Unions' Demand

Railroad brotherhoods representing about 900,000 non-operating employes of the nation's 120 Class 1 railroads last week set Oct. 25 as the deadline for carriers to meet their demand for a closed shop, wage increases of 20 cents an hour and a 70-cents-per-hour minimum wage. Management heads estimated the increases would add $450,000,000 to payrolls and prepared to reject the demands.

The ultimatum, first concerted attempt by the unions to obtain such action since the Railway Labor Act was passed in 1926, ignored the national wage agreement signed last December by both operating and non-operating brotherhoods and the fact that it does not expire until Dec. 31. A 10-cent wage raise granted at that time averted a strike.

WLB Raises Wage Scales of 2000 in Refractory Industry

Wage increases of 3 to 5.5 cents an hour were ordered by the War Labor Board for 2000 employes of ten refractory plants and clay mines of three companies. Increases were held to be necessary by the board partly to remove reported wage inequalities with the steel industry and within the plants themselves and in part to bring wages since January, 1941 up to the 15 per cent advance in living costs.

Companies affected by the order were the Harbison-Walker Refractories Co., and its plants at East Chicago, Ind., and Olive Hill and Brinegar, Ky.; the North American Refractories Co., and its plants at Ashland and Hayward, Ky., Strasburg, O., and Curwensville and Lumber City, Pa.; and Kentucky Firebrick Co., and two of its plants near Haldeman, Ky.

Vast Post-War Consumer Demand Shown by Survey

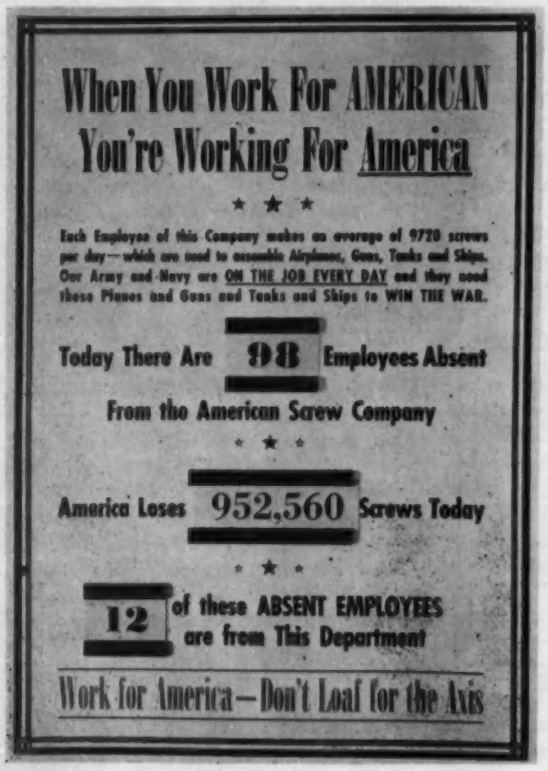
Nation-wide survey of family needs within six months after war ends has been completed by the Chamber of Commerce of the United States and a vast consumer demand is expected to develop. Survey shows that there will be need for 1,500,000 mechanical refrigerators, 1,200,000 washing machines, 1,200,000 radios and 600,000 sewing machines. Demand for automobiles is estimated at 2,100,000, and for electric irons, at 900,000. More than 1,200,000 families will want to buy furniture and rugs, while about 3.4 out of every ten home owners will make repairs. Six out of every ten farmers who own their farms are expected to repair outbuildings or erect new ones.

British Empire Countries Increase Steel Capacity

An estimated capacity of 6,000,000 tons of pig iron and ferroalloys and 6,500,000 tons of steel ingots and castings is soon to be attained by plants in Canada, India, Australia, and South Africa combined, according to a report received by the government.

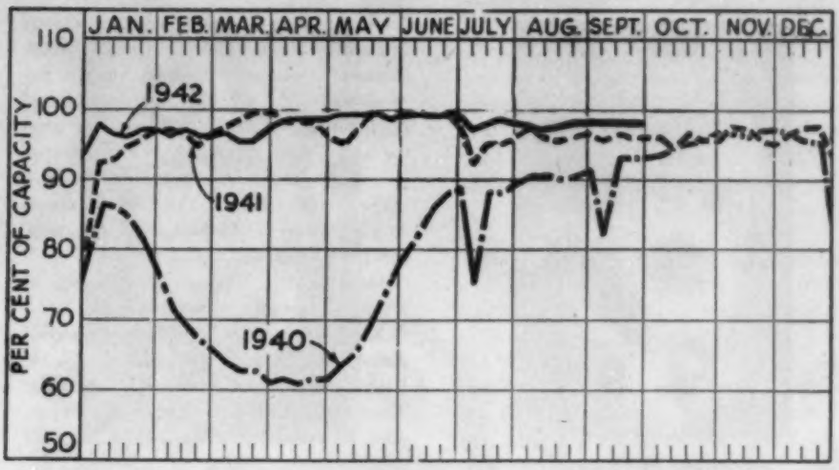
This estimate includes capacity of plants under construction as well as of plants now in operation.

In 1937, the record year before the war, combined output of these countries amounted to 3,800,000 tons of pig iron and 3,600,000 tons of steel. The increased capacity is a result of expansion projects in the major Empire countries.


When You Work For AMERICAN
You're Working For America
★ ★ ★
Each Employee of this Company makes an average of 9720 screws per day—which are used to assemble Airplanes, Guns, Tanks and Ships. Our Army and Navy are ON THE JOB EVERY DAY and they need these Planes and Guns and Tanks and Ships to WIN THE WAR.
Today There Are 98 Employees Absent
From the American Screw Company
★ ★ ★
America Loses 952,560 Screws Today
★ ★ ★
12 of these ABSENT EMPLOYEES are from This Department
Work for America—Don't Loaf for the Axis

SHAMES 'EM

ABSENTEEISM was reduced 50 per cent in American Screw Co. plant at Providence, R. I., as result of a poster campaign listing the number of absent workers and the loss of production caused by their absence. Average absenteeism before the campaign started was almost 10 per cent



STEEL . . . . . STEADY

PRODUCTION of open-hearth, bessemer and electric furnace ingots last week continued at 98 per cent for the sixth week. Two districts made gains, four declined and six were unchanged. A year ago the rate was 96 per cent; two years ago it was 93½ per cent, both computed on capacity as of those dates.

Pittsburgh—Advanced ½-point to 96½ per cent as scrap supply became easier.

Wheeling — Increased production 4½ points to 85 per cent.

St. Louis—One consumer dropped an open hearth for lack of scrap and another added a furnace after repairs, the net result being a decrease of 1 point to 91 per cent.

Chicago—Unchanged at 102½ per cent for the third week, scrap being sufficient to maintain all serviceable furnaces.

Cincinnati—Necessity for open-hearth repairs caused the rate to drop 4 points to 88 per cent.

Buffalo—Four open hearths were down for repairs again last week, the rate remaining at 90½ per cent.

Cleveland—Receded 1 point to 92½ per cent as one interest took off an open hearth for repair, which was not compensated fully by a slight advance by another producer.

Youngstown, O.—Three bessemers and 75 open hearths were in operation, holding the rate at 95 per cent for the third week. Carnegie-Illinois Steel Corp. has blown out a stack at its Ohio Works and Youngstown Sheet & Tube Co. has lighted a stack at Campbell Works.

Detroit—Down 2 points to 93 per cent.

Central eastern seaboard—On steady supply of scrap steel production held steady at 96 per cent.

Birmingham, Ala. — With 23 open hearths in production the rate was unchanged at 95 per cent.

New England—Held at 100 per cent for the third week, recent furnace repairs keeping all open hearths in service.

District Steel Rates

Percentage of Ingot Capacity Engaged in Leading Districts

	Week ended Oct. 3	Change	1941	Same week 1940
Pittsburgh	96.5	+ 0.5	98	87.5
Chicago	102.5	None	101.5	97.5
Eastern Pa.	96	None	94	92
Youngstown	95	None	98	85
Wheeling	85	+ 4.5	94	97
Cleveland	92.5	— 1	97.5	88
Buffalo	90.5	None	90.5	90.5
Birmingham	95	None	95	97
New England	100	None	83	88
Cincinnati	88	— 4	81	90
St. Louis	91	— 1	83	82.5
Detroit	93	— 2	89	94
Average	98	None	*96	*93.5

*Computed on basis of steelmaking capacity as of those dates.

U. S. STEEL SUBSIDIARY BLOWS IN A BLAST FURNACE

PITTSBURGH: Pretty Jean Rodgers aims a glowing hot rod into the tuyere and a U. S. Steel blast furnace returns to operation at Carnegie-Illinois Steel Corp.'s Clairton Works. The blowing-in ceremony came after rehabilitation of the giant furnace was achieved 21 days ahead of schedule. Miss Rodgers is a granddaughter of William Stewart, veteran blast furnace superintendent at Clairton. Others shown are H. W. Seyler, assistant general superintendent, center, and William Painter, hot blast man. U. S. Steel Corp. subsidiary photo

Fast Time in Building Furnaces for Naval Base

Rust Engineering Co., Pittsburgh, recently constructed several industrial furnaces for an overseas naval base in the unusual time of 47 days, saving 13 days of the 60 allowed by the order.

The order was received the fourth day of a month. By the tenth electrical equipment had been ordered; by the 12th control items; by the 13th all structural steel had been ordered; on the 20th drawings had been completed and all critical materials ordered.

MEN of INDUSTRY

GEORGE W. ROONEY, comptroller, United States Steel Corp., has been elected vice president, comptroller, and a member of the board of directors and executive committee, United States Steel Corp. of Delaware, Pittsburgh. He was appointed comptroller of the corporation, Oct. 1, 1940, advancing from the position of comptroller of National Tube Co., another subsidiary. Mr. Rooney has been associated with U. S. Steel since 1930.

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Theodore C. Baer, counsel, Keystone Steel & Wire Co., Peoria, Ill., has been elected a director succeeding **A. G. Heidrich.** Re-elected for three-year terms are **W. H. Sommer,** president, and **D. P. Sommer,** vice president and general superintendent; **A. H. Sommer,** superintendent of the steel mills, has been made a director to fill the unexpired one-year term of the late **Charles W. La Porte.**

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Charles C. Chamberlain has been named general sales manager of Jenkins Bros., New York. He was appointed advertising manager in 1932 and advanced to publicity manager in 1940.

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Roger Stuart Brown now represents Ajax Electric Co. Inc., division of Ajax Metal Co., New York, in the New York metropolitan area, including northern New Jersey and eastern New York state. His offices are at 136 Liberty street, New York city.

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Howard D. Grant has been elected president, and **Stevens H. Hammond,** executive vice president, Whiting Corp., Harvey, Ill., manufacturer of cranes, rotary shears, foundry equipment and other heavy machinery. Mr. Hammond will also serve as chief of the executive staff, other members of which are Mr. Grant and **D. Polderman Jr.,** formerly in charge of the New York office. **R. Elliott Maxwell** has been named vice president in charge of sales in the eastern half of the country. His headquarters will be in New York City. Until recently, Mr. Maxwell was associated with U. S. Steel Corp. as special representative for railroad sales.

George W. Rooney

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Society of Automotive Engineers Inc., New York, has announced new officers for 1943 as follows:

Mac Short, vice president of engineering, Vega Aircraft Corp., as president; **David Beecroft,** products division, Bendix Aviation Corp., as treasurer. Vice presidents elected include **John G. Lee,** assistant director of research, United Aircraft Corp., for aircraft; **S. K. Hoffman,** chief engineer, Lycoming Division, The Aviation Corp., for aircraft-engine; **Grover C. Wilson,** Research and Development Laboratories, Universal Oil Products Co., for diesel-engine; **W. M. Holaday,** automotive research engineer, Socony-Vacuum Oil Co. Inc., for fuels and lubricants; **R. E. Cole,** vice president of engineering, Studebaker Corp., for passenger-car; **G. J. Monfort,** Body Division, Chrysler Corp., for passenger-car-body; **Arnold Lenz,** assistant manufacturing manager, Chevrolet Motor Division, General Motors Corp., for production; **C. G. Krieger,** agricultural engineer, Ethyl Gasoline Corp., for tractor and industrial; **A. M. Wolf,** automotive consultant, for transportation and maintenance; **and E. W. Allen,** coach engineer, General Motors Truck & Coach, for truck and bus section.

Members of SAE Council, term of 1943-44, are as follows:

N. P. Petersen, president, Canadian Acme Screw & Gear Ltd.; **C. G. A. Rosen,** director of research, Caterpillar Tractor Co.; and **J. C. Zeder,** chief engineer, Chrysler Corp.

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C. E. Werner, sales representative, SKF Bearings Inc., Milwaukee, has resigned to become chief engineer, J. W. Hewitt Machinery Co., Neenah, Wis. He was formerly sales engineer for the Galland-Henning Co., Milwaukee.

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Desmond Sprague, mechanical engineer, Sprague Specialties Co., North Adams, Mass., has joined the engineering staff of Curtiss-Wright Corp., Propeller Division, Caldwell, N. J.

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Nelson M. Jenkins has been appointed production superintendent at the Birmingham, Ala., plant, Rheem Mfg. Co. He had previously been associated with Tennessee Coal, Iron & Railroad Co. as assistant superintendent in the tinplate mill.

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W. H. Bowden, a former official of Abrasive Co., Philadelphia, has been named president, Waltham Grinding Wheel Co., Waltham, Mass. Other new officers are **E. Paul Floyd,** formerly with Simonds Saw & Steel Co., Fitchburg, Mass.; **H. A. Johnson,** previously, with the Bonbright Co., New York, treasurer; and **R. L. Lyons,** who has been associated with the Waltham Co., general manager.

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Lawrence E. Riddle, general superintendent, Isabella furnaces, and superintendent of blast furnaces, Duquesne Works, Carnegie-Illinois Steel Corp., completed 50 years of association with the Steel Corp., Oct. 1. He was born in Cincinnati, Dec. 16, 1876, and on Oct. 1, 1892 went to work as sample boy in the laboratory of the Isabella furnaces, Carnegie Steel Co. Ltd., Etna, Pa. He was appointed assistant chemist at the furnaces Nov. 16, 1893. On Jan. 1, 1913, Mr. Riddle became superintend-

Stevens H. Hammond

Howard D. Grant

R. Elliott Maxwell

Lawrence E. Riddle

ent, Isabella and Lucy furnaces at Etna, and one year later, general superintendent, City Blast Furnace Plants of the Carnegie Co., including the Isabella, Lucy, Edith and Neville stacks. He was promoted Oct. 1, 1935 to general superintendent of City Blast Furnace Plants, Duquesne Works.

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Robert P. Breese, formerly of the Bendix Products Division of Bendix Aviation Corp., has joined General Bronze Corp., Long Island City, N. Y., as industrial development engineer.

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Ralph Bradford, secretary, Chamber of Commerce of the United States, Washington, has been appointed general manager, a new post recently created by the board of directors. For a number of years before becoming secretary, Mr. Bradford was manager of the Commercial Organization Department.

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Charles H. McCrea, vice president and director, National Malleable & Steel Castings Co., Cleveland, has been elected president of the company succeeding the late **C. C. Gibbs.** He began his career in the engineering department of the Pennsylvania railroad, after graduation from Purdue University. He joined National Malleable in 1913 at its Toledo, O. works, rising through the ranks to the vice presidency in May, 1942.

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W. Louis Bunting and **William S. Jasinsky** have been promoted to superintendent, and assistant superintendent, respectively, of the plate mills, Lukens Steel Co., Coatesville, Pa. Mr. Bunting has been with the company since 1909, Mr. Jasinsky since 1917.

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M. B. Sheik has been appointed project manager for Columbia Steel Co.'s $150,000,000 Geneva Works in Utah, authorized by the Defense Plant Corp. **E. M. Barber,** vice president, is in charge of the project. **R. C. Talbott,** temporarily in

Charles H. McCrea

charge at Geneva, resumes his position as resident engineer.

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D. L. (Doc) Immel has been promoted to assistant plant superintendent at Copperweld Steel Co.'s Warren, O. plant.

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Fred C. Tanner, vice president and former manager of sales and engineering, Federal Products Corp., Providence, R. I., has been advanced to general manager of the measuring instruments concern. He was at one time associated with Western Electric Co. as development engineer and with General Electric Co., as chief inspector of manufacturing.

OBITUARIES . . .

John Henry Towne, 73, chairman, Yale & Towne Mfg. Co., Stamford, Conn., died Sept. 29 at Mt. Kisco, N. Y. He was the son of Henry Robinson Towne, a founder of the company. Mr. Towne began work in the Yale & Towne plant following graduation from Massachusetts Institute of Technology in 1890. He was transferred to general offices in New York in 1894, was elected a director in 1898, secretary in 1904, and chairman in 1938.

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George B. Garrett, 49, sales manager of the iron and steel division, Arthur G. McKee & Co., Cleveland, was killed Sept. 24 in a train wreck near Dickerson, Md. He was on his way to Washington where he had an appointment with a war priorities board. Mr. Garrett became associated with the McKee company, builders of blast furnaces and steel plants, soon after his graduation from Case School of Applied Science in 1915.

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Frank Low, 84, vice president and sales manager, Ludlow-Saylor Wire Co., St. Louis, died recently in that city. He had been a member of the concern for more than half a century.

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Herbert L. McKinnon, 72, vice president, C. O. Bartlett & Snow Co., Cleveland, died Sept. 26 in that city. Widely known as a specialist in foundry equipment, Mr. McKinnon was responsible for his company's venture into the field of industrial machinery.

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Wilbur L. Gourley, president, Lehmann Machine Co., St. Louis, Mo., died Sept. 19.

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Harry L. Woodruff, 58, president, Atlas Copper & Brass Mfg. Co., Chicago, died Sept. 21 following injury in an automobile accident in Pontiac, Ill.

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Peter K. Vergot, 58, superintendent, Columbia Scale Co., Chicago, died Sept. 22 in Waukegan, Ill.

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Edward A. Hurley, vice president and eastern manager, Foundation Co., New York, died recently in Quincy, Mass. He was largely responsible for the design of the Bethlehem-Hingham Shipyard and new Fore River Yards ways and wet slip.

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John Gordon, 82, builder of lake coal cranes, died Sept. 26 in Cleveland. A mechanical engineer for Pittsburgh Coal Co. 37 years ago, Mr. Gordon supervised construction of small coal cranes to fill cargo holds of lake vessels. Until his retirement seven years ago, he had charge of construction of the larger car dumpers that line the shores of lake ports.

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Samuel A. Williams, 65, assistant manager, Atlas Car & Mfg. Co., Cleveland, died Sept. 23 in Cleveland.

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James Turner Gibson Sr., 73, superintendent of blast furnaces at Ensley Works of Tennessee Coal, Iron & Railroad Co., died Sept. 17 at his home in Birmingham, Ala.

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Col. Henry C. Nutt, 79, retired president of the Monongahela railroad, died Sept. 26 at his home in Boston. He became president of the railroad following his return from overseas service in the first World War, retiring in 1933.

Bureau of Priorities Control Established by War Board

ORGANIZATION of a Bureau of Priorities Control was announced last week by J. A. Krug, deputy director general for priorities control.

The office will include a deputy director, four divisions and a total of 15 operating branches, an appeals board and a clearance committee.

Edward Falck will serve under Mr. Krug as assistant deputy director general for priorities control.

Top staff members of the bureau, in addition to Mr. Krug and Mr. Falck, are: Dr. A. N. Holcombe, chairman, appeals board; Donald Uthus, chairman, clearance committee; Henry P. Nelson, chief, system planning; Herman Director, assistant chief, system planning; John H. Martin, chief, program liaison; Dr. Samuel S. Stratton, director, priorities review division; Joseph Tucker, director, Canadian priorities; John H. Ward, director, compliance division; C. E. Rhetts, director foreign division, and a director, yet to be appointed, of the materials control division.

Chiefs of the branches within the four divisions are:

Materials control division: PRP Branch, C. M. Schoenlaub, chief; emergency rating branch, D. C. Gallagher, chief; distributors' branch, L. C. White, chief; materials scheduling branch, to be appointed; materials records branch, to be appointed.

Priorities review division: Routing and issuance branch, C. C. Crossland, chief; review branch, W. G. W. Glos, chief; appeals branch, H. T. Bourne, chief; field contact branch, J. J. Burnett, chief.

Compliance division: Survey and analysis branch, H. J. Dowd, chief; business contact branch, Mason Manghum, chief.

Foreign division: Reports and control branch, J. D. Coppock, chief; foreign priorities branch, E. C. Garwood, chief; Russian supply branch, British Empire supply branch, Latin American supply branch, Middle and Far East supply branch, to be appointed.

Steelmakers Get Maintenance Supplies Over PRP Limits

Iron and steel producers will be permitted to accept deliveries of maintenance, repair, and operating supplies in excess of the amounts authorized under the Production Requirements Plan when necessary for essential operations, Ernest Kanzler, Director General for Operations, has announced.

Manufacturers have been notified of this permission by telegram, which makes it clear that the action taken is on a trial basis.

It was pointed out that it is essential to maintain steel mill production and that uncontrollable factors make it difficult to estimate in advance operating and maintenance needs for this industry.

A-1-a Rating Required for Copper Scrap and Ingot

Copper scrap, copper-base alloy scrap and ingot will be available to foundries only when their orders bear preference ratings of A-1-a or higher, the Director General for Operations announced in a letter to the industry.

Essential orders bearing ratings as low as A-1-j heretofore have been receiving some of this metal, but because the need grows constantly more urgent for copper, copper scrap, copper-base alloy ingot and scrap, only special authorization by the Director General for Operations will now enable the metal to be shipped on ratings lower than A-1-a. Primary copper has been available for only A-1-a and higher orders for several months. The new order puts scrap and ingot in the same position as primary copper.

Foundries apply for their requirements each month on Form PD-59 and PD-123, pursuant to Order M-9-b. Authorizations to use metal requested on these forms, beginning with the month of October, will be granted only to requests for metal to fill orders bearing preference ratings of A-1-a or higher. Applications for Form PD-59 are required to be filed with WPB on or before the 5th of the month preceding the month in which delivery is sought.

Industrial-Size Coal To Be Sold at Run-of-Mine Prices

To speed production of industrial-size bituminous coal, mine operators, under certain conditions, will be allowed by OPA to sell crushed coal at run-of-mine prices.

Previously industrial coal (fine sizes) generally sold at prices below those for

RCA WAR RALLY ATTRACTS 60,000

THIRD phase of RCA Mfg. Co.'s "beat the promise" campaign was opened recently with a gigantic rally and war show which attracted more than 60,000 war workers and their families at Garden State Park near Camden, N. J. The crowd, part of which is pictured above, heard speeches by war production leaders, cheered war heroes, laughed at comic impersonations of Axis leaders, thrilled to a program of martial music

PRIORITIES–ALLOCATIONS–PRICES

Weekly summary of orders and regulations issued by WPB and OPA, supplementary to Priorities-Allocations-Prices Guide as published in Section II of STEEL, July 6, 1942

M ORDERS

M-104 (Amendment): **Closures for Glass Containers,** effective Sept. 28. Makes black plate rejects subject to quota restrictions of the order.

M-148 (Amendment): **Exports of Critical Material,** effective Sept. 28. Provides that an order from the holder of an export license issued by the Board of Economic Warfare shall be filled in accordance with the preference rating assigned by BEW. Removes restrictions contained in WPB limitation orders, in so far as they might apply to inventory or use in foreign countries of materials rated by BEW. Holders of outstanding export licenses issued by BEW to which the M-148 allocation stamp has been affixed will rerate the authorization to AA-2X.

M-199 (Amendment): **Silver,** effective Sept. 29. Extends to Nov. 15 period for processing foreign silver, if in process before Oct. 1, 1942. Permits delivery to manufacturers, including laboratory, plating or repair operations. Prohibits sale of foreign silver, semi-processed materials, or scrap except to suppliers or to Metals Reserve Co. Places ban on use of foreign silver in production of all jewelry.

M-227 (Amendment): **Copper Chemicals,** effective Sept. 24. Permits farmers to obtain copper chemicals for soil treatment, insecticides and fungicides without filing PD-600 forms.

P ORDERS

P-118 (Amendment): **Dairy Machinery,** effective Sept. 29. Extends order for 90 days to Dec. 31 by which preference ratings of A-1-j are assigned for maintenance and repairs and A-3 for operating and replacement needs.

L ORDERS

L-64 (Amendment): **Burial Equipment,** effective Sept. 24. Limits use of iron and steel from Sept. 24 to Dec. 23 in joining hardware to 6 lb. per casket and to 4 lb. if casket contains handle hardware assemblies fabricated prior to March 28. Weight of joining hardware limited to 4 lb. per casket after Dec. 23. Bans use of iron and steel in handle hardware Sept. 24, except fabricated assemblies in inventory prior to that date. Restricts amount of iron and steel in each liner to 50 lb., not exceeding 26 standard gage thickness, except thicker material in inventory prior to March 28. Permits use of lead in liners for caskets and for soldering. Limits use of iron or steel in joining hardware for shipping cases or burial vaults to 2 lb. per unit and for handle hardware to 3½ lb. per unit for shipping cases. Bronze and other metallic finishing materials in inventory on March 28 may be used.

L-104 (Amendment): **Metal Hairpins and Bob Pins,** effective Sept. 25. Restricts production to 25 per cent of 1941 rate, prohibits bulk sales and provides that no more than 100 pins may be included in one package. Ban against purchase of high-carbon steel wire used in manufacture of bob pins is removed.

L-148 (Amendment): **Wire Communication Equipment,** effective Sept. 25. Permits delivery of equipment for telephone and telegraph companies, if it was 90 per cent or more completed by Sept. 8.

L-196 (Amendment): **Used Construction Equipment,** effective Sept. 29. Extends time for owners to register equipment with WPB regional offices to Oct. 31. All owners of the type of machinery listed must file Form 1159.

PRICE REGULATIONS

General Maximum Price Regulation (Amendment): **Silicomanganese,** effective Oct. 8. Authorizes increases of $7 a gross ton in maximum prices for all grades of silicomanganese to basis of $135 per gross ton on the 1½ per cent grade.

General Maximum Price Regulation (Amendment): **Silver Salts,** effective Sept. 22. Permits producers to add to their maximum prices amount per unit by which cost of production is increased as a result of higher silver bullion or silver compound cost.

No. 49 (Amendment): **Iron and Steel Products at Resale,** effective Oct. 1. After Oct. 1, sales of distress or standard iron and steel products destined for export become subject to price regulation No. 204 (Idle or Frozen Materials Sold Under Priorities Regulation No. 13). All other interests engaged in reselling domestically must dispose of idle or frozen items under Price Order No. 49.

No. 230—Reusable Iron and Steel Pipe, effective Oct. 3. Establishes maximum prices for pipe other than oil country tubular goods in terms of percentage of jobbers' resale prices on new pipe at 70 per cent of list price of lowest grade of new pipe having the same diameter and weight per foot. Prices for reusable oil country tubular goods are 75 per cent. Provides premiums for segregation and thorough reconditioning.

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run-of-mine. The OPA action, taken in amendment to Price Regulation 10, will permit mine operators to crush lump, double-screened and run-of-mine coal and sell it at run-of-mine prices.

Demand for industrial-size coal, OPA explained, has outrun normal production since Pearl Harbor, and operators naturally have been reluctant to crush higher-price coal to be sold at industrial-size prices.

Scientists To Determine Scope of Office of Technical Development

Appointment of a committee of engineers and scientists to determine the manner in which a projected Office of Technical Development should be set up within the WPB, and to define the scope, functions and method of operations which the office should have, was announced last week by Chairman Donald M. Nelson.

Chairman of the new committee is Webster N. Jones, director of the college of engineering, Carnegie Institute of Technology, Pittsburgh. Other members:

Dr. Lawrence W. Bass, director of research, New England Industrial Research Foundation, Boston.

Dr. Oliver E. Buckley, president, Bell Telephone Laboratories, New York.

S. D. Kirkpatrick, editor, *Chemical and Metallurgical Engineering,* New York.

Col. Clarence E. Davies, Ordnance Department, United States Army, Washington.

Dr. Ray P. Dinsmore, manager, development department, Goodyear Tire & Rubber Co., Akron, O.

Admiral J. A. Furer, United States Navy, Washington.

Dr. Jerome C. Hunsaker, head of the departments of mechanical and aeronautical engineering, Massachusetts Institute of Technology, Cambridge, Mass.

H. W. Graham, director of metallurgy and research, Jones & Laughlin Steel Corp., Pittsburgh.

Additional Advisory Committees Appointed

Additional advisory committees were appointed last week by T. Spencer Shore, chief of the WPB Division of Industry Advisory Committees.

Abrasives

Arthur Batts, Carborundum Co., Niagara Falls, N. Y.; J. H. Byers, Abrasive Products Co., Lansdowne, Pa.; R. R. Cole, Monsanto Chemical Co., St. Louis; A. T. Dalton, Chicago Wheel & Mfg. Co., Chicago; E. B. Gallaher, Clover Mfg. Co., Norwalk, Conn.; W. A. Harty, Exolon Co., Blasdell, N. Y.; C. N. Jeppson, Norton Co., Worcester, Mass.; H. D. Williams, Washington Mills Abrasive Co., North Grafton, Mass.; J. Kuzmick, Manhattan Rubber Mfg. Division of Raybestos Manhattan Inc., Passaic, N. J.; S. B. Leishman, Gardner Machine Co., Beloit, Wis.; T. J. McIntyre, Macklin Co., Jackson, Mich.; W. L. McKnight, Minnesota Mining & Mfg. Co., St. Paul, Minn.; J. W. McLean, Abrasive Co., Philadelphia; A. V. Parker, General Abrasive Co., Niagara Falls, N. Y.; P. R. Shuttleworth, Allison Co., Bridgeport, Conn.

Antifriction Bearings

J. J. Donovan, chief, Replacement Parts Section, Automotive Branch, is the government presiding officer.

Committee members: E. H. Austin, Timken Roller Bearing Co., Canton, O.; V. A. Dupy, United Motors Service Inc., Detroit; L. R. Murphy, Roller Bearing Co. of America, Trenton, N. J.; J. H. Thorsell, Marlin Rockwell Co., Jamestown, N. Y.

Material Requirements Subcommittee, Automotive Replacement Parts

J. J. Donovan, chief, Replacement Parts Section, Automotive Branch, is the government presiding officer.

Committee members: K. J. Ammerman, Borg-Warner Corp., Chicago; B. B. Bachman, Autocar Co., Ardmore, Pa.; F. C. Bahr, Chrysler Corp. Parts Division, Detroit; V. E. Doonan, Ford Motor Co., Dearborn, Mich.; M. D. Douglas, Chevrolet Motor Co., Detroit; A. L. Johnson, Warner Machine Products Co., Muncie, Ind.

Hairpin, Bobpin Manufacture Limited to 25% of 1941 Output

To reduce the amount of steel use in the production of hairpins and bobpins, Order L-104 has been amended to restrict manufacture to a rate equal to 25 per cent of 1941 production. The original order, issued April 25, had already cut production by 50 per cent.

Compared with 1941 consumption, approximately 5700 tons of steel will be saved as a result of the curtailment. In 1941 over 7600 tons of steel were used in the industry.

WINDOWS of WASHINGTON

United States entering era of shortages—of materials, manpower, food, clothing and all civilian goods. Controls over available supplies to become more strict and rationing more widespread

FOR months past responsible authorities in Washington have warned that tough times lie ahead for everybody in this country. Anybody who regards these warnings as cries of "wolf" is making the mistake of a lifetime.

At the risk of further reiteration and repetition, it seems advisable to analyze the prospects—since failure on the part of individual citizens and businessmen to plan wisely for the immediate future may prove embarrassing and costly. It generally is realized that tough times lie ahead, but very few people anticipate just how tough they are going to be.

In girding our strength to fight the war, there first was all-out emphasis on planning, constructing and tooling-up. Then the emphasis was shifted to "conversion" from peacetime to wartime production. Our latest problem has been a lack of materials needed to keep all war plants in full operation.

When this latest phase of the war program became a problem it was not unexpected. There originally was no experience on which to base estimates of capacity to produce machines of war. Contracts were placed right and left for all manner of ordnance, either needed or believed to be needed—and the contractors were urged to get going just as soon as possible and produce as much of every item as they possibly could.

Now it turns out that the productive capacity in the war plants is in many cases far greater than had been anticipated. It may be explained that this result, while presenting new difficulties, has its highly gratifying side. That is, it is easier to slow down production of items that are ahead of schedule than it is to bring them up to schedule.

A manufacturer holding an important production responsibility here illustrates the present condition of unbalance by telling about an incident that occurred at his plant a number of years ago.

Stocks Unbalanced

"During the depression," he says, "we kept our inventories at minimum in order to keep overhead down. One day we had to stop the assembly line because we were all out of bolts of certain needed sizes. I checked into the reason for this shortage and found that three carloads of wire had been delivered to be converted into bolts in our cold heading department. It turned out that all this wire had been manufactured into bolts of three sizes. There we were with enough bolts in three sizes to last for three or four years, whereas we needed 27 other sizes.

"As a result of that lesson we organized a scheduling system of a most comprehensive character and we never again had to shut down the assembly line for lack of needed parts. That is where we are today on the nation's war assembly line. We now are working up the necessary scheduling system."

The thinking as to how this scheduling is to be accomplished already has reached an advanced stage. A workable system is in sight. While it is too early to discuss details, it may be described as aimed at stretching out our materials for maximum possible production, rather than merely trying to fit production to available materials. It calls for planning far in advance, just as private industry in normal times formulates its plans far in advance of their execution. Fortunately the scheduling system is being formulated with the aid of men long successful in production scheduling on a large scale.

Some of the new scheduling already is in effect and it is possible that the problem as a whole will have been disposed of by the end of the year.

The next big problem on the immediate horizon is that of labor supply. Officials concerned with this problem point out that it will be even more difficult to solve than the problem of materials. Many difficulties will have to be overcome in order to mobilize our manpower on the scale that is necessary.

They are pretty well agreed that they cannot do the job unless Congress legislates a draft labor bill under which each individual can be put at the work the country wants him to do. Efforts so far made under the voluntary system have proved unsatisfactory. Men can

Newly organized Production Executive Committee, members of which are shown above at the committee's first meeting, will keep a constant check on the flow of materials into war materials. Left to right: Rear Admiral Howard L. Vickery, vice chairman, Maritime Commission; Lieut. Gen. Brehon B. Somervell, United States Army Services of Supply; C. E. Wilson, chairman; Vice Admiral Samuel M. Robinson, United States Navy procurement; Maj. Gen. Oliver P. Echols, Army Air Force. NEA photo

find many reasons for refusing to act on requests that they accept a switch in employment. It is hard, for example, to dissuade miners from going out and engaging in work that pays more, but it will have to be done in order to get out metallics in adequate quantities for the war effort.

Need Labor "Czar"

The job of manpower mobilization involves many possibilities, most of which still remain to be decided. For example, serious thought is being given to closing gold mines in order that the miners may be shifted over to production of more essential ores. No spectacular aspects of manpower mobilization are expected to take form until such time as the War Manpower Commission or some manpower or labor "czar" is clothed with the necessary authority. But manpower needs very shortly will bite deeply, not only because of the vast numbers of men to be siphoned off by the armed forces but also because of the increase in the number of workers to be needed in the production program as now envisioned.

We are producing war goods in 1942 valued at around 45 billions of dollars. President Roosevelt originally asked that this figure be increased to 60 billions in 1943. Recently the Army and Navy raised the 1943 figure to 85 billions—and the officials in charge of production declare that this figure must and will be reached. The latter figure compares with our entire national 1942 income—98 billions!

That figure of 85 billions should be a stopper to every manufacturer who has the least doubt as to whether products he now is making will be subject to limitation orders still to be issued. It is the opinion among responsible leaders in Washington that businessmen have not yet reflected the degree of imagination that is necessary in planning realistically for what may come in future months.

For example, silverware manufacturers recently complained about the order forbidding use of silver in the manufacture of ornaments. Certain senators tried to get alleviation for them but without success, since silver now is a critical metal. It is true that if Congress were to authorize the Treasury to make all its silver available for industrial use, the manufacture of silver ornaments could be continued for a time to come. However, such a move would provide only temporary relief since silver is needed increasingly in the war production program. There is the other question as to how long workers would continue to be allowed to produce ornamental silver, or how long producers of silver ornaments could continue to get electric current and obtain other necessary services and supplies.

What is said about the present status of the ornamental silverware manufacturers applies also to many other manufacturers of products that may in the future come to be ruled out as unessential. Those responsible for production planning repeatedly have made it clear that there is to be no pampering to bolster morale by diverting materials to non-essential production and that the less essential industries, therefore, are going to fare badly.

Each sickness in this war has brought a cure that in turn created another sickness. The critical condition of the supply of materials, together with the coming critical labor shortage, are going to bring new shortages.

One shortage that cannot be avoided, in the opinion of planners, is a food shortage. This will result from a shortage of agricultural workers, a shortage of repair parts for agricultural implements as well as for food processing equipment, together with huge shipments of food to foreign destinations. Transportation also may become a bottleneck. In fact, the trend toward a food shortage already has gained some momentum; fruit crops were left to rot on a substantial scale this summer because pickers were unavailable in required numbers.

The food problem also, it is expected, will require some reorganization since too many experts in one department or another now have something to say about food control. The recent experience with reference to rubber and gasoline taught a badly needed lesson here, that unless responsibility is definitely assigned there can be no effective controls. Hence a food control seems in sight for the near future.

A shortage of clothing very definitely is seen ahead. This also will result from the labor shortage and from the scarcity of repair parts for textile mills. Incidentally, the matter of scarcity of spare parts is getting to be very difficult even in keeping essential industries going. For example, trouble has been encountered in keeping mining machinery going because of lack of repair parts.

Spare Parts Scarce

Something will have to be done about this problem of spare parts, and it will be done under the new system of scheduling now being worked out. However, it is certain that no more than minimum consideration will be given to providing spare parts for machinery such as used in the textile mills. The term "minimum" in the foregoing statement has reference to textile requirements for the armed forces, with minimum quantities for civilians.

Not long ago it was generally believed that the woodworking industry was on safe ground, particularly because wood can be used in so many applications as a substitute for metals. Recently, however, most lumber has been placed under strict priority and use control. Now a general shortage of wood is ahead. The number of lumberjacks getting out the timber has been reduced and will become further reduced. Less labor is available for operating woodworking plants. It will become more difficult to get repair parts for machinery for timbering and woodworking.

An acute housing situation is expected to appear when it becomes necessary to draft and reassign workers on a large scale. Shortages of labor and of materials necessary to provide housing on the needed scale are expected to combine to form a real problem.

Business from this time forth can expect to see the establishment of one control after another. All of these will be aimed at overcoming some shortage or other, either of labor, materials, transportation or other shortages some of which are not yet foreseen. Many controls will be accompanied by rationing. Rationing of sugar, rubber and fuel oil,

SECRETARIES AT WAR

INTO big baskets like the one above, 150 secretaries at Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., dumped 3250 pounds of unnecessary mail and material from files in a 30-day drive. They saved 2610 hours of time, prompted officials to extend the drive to other divisions, "streamlining" office work to aid war work

"Don't shoot, Mr. Crockett"

This country was explored, staked out, settled and defended by men with firearms in their hands. By the time of Texas independence gunsmithing had developed from the trade of the armorer into a much more specialized and refined skill. First to make guns of a degree of precision permitting the interchange of parts were the gunsmiths of the old National Hydraulic Company from which Jones & Lamson traces its industrial ancestry. These superior rifles were in great demand on the frontier and many were supplied to the "Lone Star Republic." A favorite Vermont story of the times deals with the famous frontiersman and patriot, Davy Crockett. One day, armed with his rifle, Crockett had drawn a bead on a treed coon when the coon, recognizing the famous crack shot (and perhaps even his rifle) spoke up:— "Don't shoot, Mr. Crockett, I'll come down."

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. . . I'll come down"

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But more was accomplished than the making of better guns . . . more was brought down than Davy Crockett's coon. This improved technique literally began the career of the modern high-grade machinist and toolmaker. And from the skill gained in making weapons of destruction came the civilizing force of modern machine tool production.

Today this skill and ingenuity plus all that science and the years can teach are devoted, not only to meeting the needs of industry in time of war, but to anticipating the country's wants in the years ahead . . . when the forces of destruction shall be made to serve the needs of peace.

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and the nation-wide rationing of gasoline, represent only a starter. The current outlook is that before very long most consumer goods will be rationed. Much more could be said about the "tough" situation that lies ahead. The foregoing, however, should suffice to show that it is going to be plenty tough.

Control of Carbon, Alloy-Type Tool Steels To Be Consolidated

New order supplementary to M-21 now is being drafted by the WPB Iron and Steel Branch to "wrap up in one package" control of both carbon and alloy types of tool steels. It will replace and extend the restrictions now applying under Orders M-14, M-21 and M-21-a.

Under the new order, users of tool steels will be asked to use less of the high-molybdenum types (averaging 8.5 per cent moly) and more of the high-speed (18-4-1 or 14-4-2) or middle-group molybdenum types averaging 4.5 per cent molybdenum and 5.5 per cent tungsten.

New regulations will save some molybdenum at the expense of tungsten, it is pointed out, but this will work no further hardship since supplies of the latter are relatively freer than some time ago.

Steps already have been taken to make the provisions of the new order effective through directives which have been sent both to producers of tool steels and makers of metal cutting tools.

Steel producers were instructed to schedule the melting of high-speed Grade II and Grade III, Class A steels on Form PD-440 for October in quantities not more than 70 per cent of average monthly melt during the second quarter of 1942, for November at not more than 50 per cent of such average and for December and subsequent months at not more than 30 per cent. Grade II is high-molybdenum, low-tungsten type, and Grade III high-molybdenum-vanadium type.

Steel producers also were told to deliver in fourth quarter not more than 75 per cent of the combined amounts of Grade II and Grade III, Class A high-speed steels delivered in second quarter of this year, except that the restrictions do not apply to flat-rolled sheets. At the same time, they were told to schedule for melting a sufficient amount of Grade I, Class A molybdenum high-speed steel (so-called 6-S type) to make up for the deficiencies in Grade II and Grade III.

A directive also was sent to producers of metal cutting tools by the Industrial Specialties Branch of WPB advising them to revise requests for delivery in fourth quarter in accordance with these regulations.

Production Directives Stabilize Steel Production, Employment

System of issuing steel and production directives, inaugurated by the WPB Iron and Steel Branch about two months ago, is proving successful in directing the production of the most urgently needed steel products and strengthening controls over output, according to Hiland G. Batcheller, chief of the branch.

A committee of the branch, known as the production directive committee, meets with representatives of each steel producer to plan monthly output by products. The committee investigates all pertinent facts, such as the company's producing facilities, unfilled orders, relative priority ratings, etc., and then formulates a production directive indicating the product distribution for the company on a monthly basis.

This directive reflects the basic determinations of the WPB Requirements Committee. For instance, if the Requirements Committee has determined that 1,100,000 net tons of plates should be made in a particular month (this is the present figure), the total of all directives issued will equal this figure. The part of the total tonnage to be made by each producer is determined by the Production Directive Committee.

Within the limits of each Production Directive, companies must schedule their orders on a priority basis. That is, if a company is directed to produce 5000 tons of bars per month, it then schedules the 5000 tons of bar orders on its books which have the highest priority ratings, and which are to be delivered in the specified month.

In respect to nonintegrated steel companies (those who purchase steel for further conversion) the Production Directives are issued on a slightly different basis. The committee schedules the rate of operations of the producer on a basis comparable to integrated steel companies manufacturing the same product. The directive is then supported by an allocation of the necessary steel from specified integral companies to the non-integrated producer. In this manner, the nonintegrated producer can plan his operations on the same basis as the integrated producer.

The committee has issued 84 production directives, 46 to integrated producers and 38 to nonintegrated producers. Practically all of the integrated producers have been covered but a large number of the nonintegrated companies are yet to be directed. Full coverage of the industry in 30 to 60 days is expected.

Mr. Batcheller said that the production directives are increasing output because of their stabilizing effect. They are also creating steadier employment for labor and providing the means of making changes in the steel product distribution in the best interests of the war effort.

The directives are signed by the Director General for Operations. They remain in effect until changed and are constantly reviewed, and if necessary, revised by the branch.

August Munitions Production Increases 8 Per Cent

Munitions production in August was 8 per cent higher than in July but was 14 per cent below the goal for the month, WPB Chairman Donald M. Nelson reported last week.

Total value of munitions produced and war construction during August was $4,700,000,000.

Mr. Nelson said aircraft output increased 6 per cent; ordnance, 3 per cent; naval ship construction, 7 per cent; merchant shipbuilding, 6 per cent; and other munitions, 14 per cent.

The WPB munitions index, covering all implements of war, shows production now is more than 3½ times as large as in the month preceding Pearl Harbor.

Admitting the increases are impressive by themselves, Mr. Nelson reminded that they still fall far short of the goal and that greater effort must be exerted during the last quarter of the year.

More encouraging was this assurance: "Available information indicates this year our total output of munitions at the least will equal that of German-dominated Europe, including France, Italy and the Balkan states.

"Studies indicate our rate of production already has caught up and passed that of the countries on the European Continent."

Vertical System of Materials Control To Be Instituted by WPB

New vertical system of materials control largely will supplant the present horizontal setup as soon as the machinery can be placed in motion to effect the changeover.

As reported in STEEL last week, the priorities system will be virtually abandoned and replaced with a complete and detailed scheduling plan affecting practically every manufacturer.

The horizontal system wherein materials are allocated or distributed through priority ratings to manufacturers without regard to the quantity of end-products produced works well when materials are only relatively scarce.

The horizontal system, however, fails when extreme scarcities develop in many items. For example, there is extremely competitive demand for the available supply of many types of steel going into ships, tanks, planes and the like. All these outlets merit equally high priority ratings, yet the decision must be made as to which actually should get the steel first.

Under the vertical system, it is first determined what end-products are required in relation to the total amount of material available. The actual job of laying out schedules for these end-products is up to the armed services, the Maritime Commission, and other war agencies, which tell WPB their exact needs. WPB then translates this information into plant production schedules to balance with the material supply. Where necessary, WPB will go back to the services and ask them to revise requirements of finished products. For instance, a number of units might be clipped off the schedule. With the experience of many months behind them the services now are reported to have a relatively clear picture of what is needed.

A number of standard items like bolts and nuts, bearings, fasteners and Mazda lamps accounting for approximately 20 per cent of the total production program must be treated on a horizontal basis, however, since it can be fairly accurately determined what will be needed but not exactly who will take them.

Industry now is nominally operating under the Production Requirements Plan through which some 27,000 concerns have indicated to WPB on Form PD-25-a their material needs for fourth quarter. These forms have not been returned but are due back soon. In the meantime, industry may operate under Priorities Regulation No. 11 which permits receipt of 70 per cent of the material requested under PRP.

PRP cannot be dropped flatly but is the foundation on which an improved scheduling system can be based. The priorities rating system also cannot be dropped entirely. Even under close scheduling on a monthly basis, relative standings on materials must be determined to keep them flowing evenly during the period. For instance, it must be decided whether copper shall be shipped to a user at the beginning of the month or part of it held up until the fifteenth.

Nonessential Use of Tin To Be Further Restricted by War Board

Further drastic reduction in the consumption of tin for nonvital purposes made necessary by a substantial rise in military needs will be effected through a complete rewriting of WPB orders M-43 and M-43-a. At the same time, a 50 per cent reduction in tin plate quotas for fourth quarter as compared with the average for second and third quarters will effect an immediate cut in the amount of tin used during the remainder of the year.

While the lower tin plate quotas now being worked out for the final quarter of this year partially reflect the off-season period in the canning trade, it is believed that the reduction will be continued into 1943.

While details of the new tin control are not yet available, it is likely to require further changeover to lead-base bearing alloys in place of tin-base; substitution of tin-lead alloy for tin in coating copper wire; further reduction in use of tin in solders; use of more low-tin or tin-free bronzes and more complete control over tin plate for use in containers.

The canning industry will be required to use electrolytic tin plate for an extensive list of applications, including sanitary cans. Practice in making electrolytic tin plate has been so improved that it may be used for many purposes for which canmakers previously deemed it inadvisable.

Coatings on hot-dip plate already are being held down to a maximum of 1.25 pounds per base box but makers of electrolytic plate will be required to shoot for a top of 0.5-pound per box. Even when the new electrolytic units now being constructed go into production, a maximum of 0.7-pound has been set until a definite practice has been established. One unit will be in by the end of the year and four others are expected in by April 1.

It is indicated that hot-dip plate will be used only for a limited number of applications. In fact, tin plate may no longer constitute the principal outlet for tin.

No fear is expressed in Washington that insufficient supplies will be available for military uses. Although the Axis has cut off the source of principal supplies prior to the war, production has been greatly stimulated in other quarters, including the Belgian Congo, Nigeria and Bolivia. Output of the Texas City, Tex., smelter with an annual capacity of 52,000 tons also is increasing satisfactorily.

Exports Made Subject To Preference Ratings

As a part of current moves to centralize control of materials distribution in the WPB, deliveries for export under General Exports Order M-148 have been made subject to the assignment of preference ratings.

The General Exports Order as amended provides that an order from the holder of an export license issued by the Board of Economic Warfare shall be filled in accordance with the preference rating assigned to the order by BEW. Specific authority to assign such ratings for definite amounts of materials will be delegated to BEW by the Director General for Operations. Previously, orders from the holders of export licenses were in certain cases given preference over all others.

Quotas of material for export to foreign countries will continue to be assigned as before by the Requirements Committee and export licenses and preference ratings covering the materials in these quotas will be issued by the Board of Economic Warfare. BEW will continue to be responsible for determining the amounts which will go to individual countries and individual purchasers within the assigned quotas.

1

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By A. H. ALLEN *Detroit Editor, STEEL*

MIRRORS of MOTORDOM

Engineers perfect metal-saving methods for manufacture of armament. . . Intensified scrap policy enunciated. Will mean disposal of additional quantities of tools, dies, fixtures

DETROIT

FOR a good many years, the No. 1 job of design and process engineers of the motor companies has been a constant vigil over manufacturing methods to see that maximum utility of materials and equipment was being realized. Under the stern whiplash of costs, they explored every avenue of substitution, conservation, simplification. Their efforts made the motor car what it is today, and if occasionally they fell behind, the competitive "hot-foot" soon stirred them into action again.

Today it is all different. The cost and competitive incentives have been suspended and the pressure is entirely on getting out the stuff ahead of time. However, another factor, conservation of critical materials, is of paramount importance in war production, so engineers still are being spurred on to developing materials and equipment in the interests of conservation. It is work with which they are all familiar, even though the incentive goes under a new name.

As the largest unit in the motor industry, General Motors Corp. has had many engineers and production experts concentrating on the problem of conservation. Their work has been slowed somewhat by the difficulty of "selling" the armed services specifications changes, but this obstacle is not nearly as serious as it was even a year ago.

A number of case histories can be cited to show important savings in critical materials which automotive engineers have achieved in war products, savings which C. E. Wilson, GM president, says "can be regarded as typical of what the automotive industry, and industry generally, is doing. They are the dividends which the government is collecting from our investment over the years in engineering production know-how. As time goes on, there will be many more such developments as our engineers and production men become more familiar with the new products they have been called upon to produce."

Here are brief details of a few case histories involving materials conservation:

1. Until recently one part of an anti-aircraft gun had to be "chewed" down from a 56-pound solid steel forging to a 6-pound hollow slotted cylinder. Pontiac engineers suggested the forging be replaced by steel tubing welded to a forged base. Result—a saving of 42 pounds of alloy steel scrap per part.

2. Guide Lamp Division perfected a method of drawing army truck headlamp reflectors from steel instead of brass. The new method uses 78,000 pounds of steel and 5 pounds of aluminum per 100,000 vehicles, while the old system required 65,000 pounds of copper, 32,000 pounds of zinc, 275 pounds of nickel and 160 pounds of silver for the same number of headlamps. Estimates indicate the following monthly savings realized by changes in lighting equipment: 21,000 pounds of copper, 12,000 pounds of zinc, 6000 pounds of rubber, 2300 pounds of chrome steel, 240 pounds of aluminum and 135 pounds of nickel.

3. Chevrolet found it possible to reduce the thickness of the copper rotating band on shells without affecting performance, sought and obtained approval from Ordnance on the change, and effected a saving in copper amounting to 65,000 pounds per million shells.

In the case of trucks, Chevrolet estimates alternate materials have saved, for every 100,000 units produced, a total of 5,000,000 pounds of crude rubber, 1,200,000 pounds of nickel, 500,000 pounds of copper, 200,000 pounds of chromium, 125,000 pounds of latex and 70,000 pounds of tin.

4. Delco-Remy Division has substituted battery cases of asphalt and cotton linters in place of hard rubber, and has redesigned battery grids so that only 7 per cent antimony is used in the lead instead of the former 11⅛ per cent.

5. Delco Products Division is saving 100,000 pounds of bronze yearly by eliminating two bronze bushings in shock absorber castings for trucks. The castings now are bored to finished bearing size. Another saving of 3¼ pounds of aluminum per motor has been achieved by redesigning the rotor, using copper bars for conductors and making fans of cast iron.

6. A difficult war assignment was the production of rotator vanes for superchargers on aircraft engines. Cadillac designed special machines for the job, changed it from more or less hand machining to mass production and, in addition to important time savings, cut down on steel forging requirements to the extent of 496,000 pounds a year.

7. Engineers of AC Spark Plug Division asked why it would not be more sensible to start with a thin steel plate

SOLDIERS STUDY TURRET MAKE-UP AT PLANT SCHOOL

ENLISTED men in the Army Air Forces dismantle a new type of bomber turret in the turret maintenance school operated by Briggs Mfg. Co., Detroit, where several hundred men are being given technical training, the first class graduating Sept. 19. Briggs has erected a new blackout plant for construction of these turrets and production is now well under way

and build up the thick end of a machine gun side plate by upset forging. Conventional method has been to start with a thick plate and shave half the thickness off except for a bump at one end. The Ordnance Department finally approved the suggestion which brought a saving of 9 pounds of steel per gun, as well as many hours in time required for machining.

8. Need for conserving copper prompted engineers of the Harrison Radiator Division to redesign heat exchangers or radiators for aircraft engines. In the case of one aircraft radiator, aluminum construction was substituted, not only saving 84 pounds of copper per unit, but saving production time and adding 52 pounds to the airplane's load-carrying capacity.

9. Several GM divisions are saving on high-alloy tool steel by making tools of carbon steel except for a thin strip of tool steel welded on the cutting edge. In one case, only 0.7-pound of high-speed steel now is used per tool, instead of the former 10.3 pounds.

10. Buick engineers found that changing from steam hammer to upset forging would save 19 pounds of steel on each propeller shaft forging being made for aircraft engines. Also, a change from steam hammer to forging press saved 7 pounds of steel on every fixed reduction gear for these engines.

GM plants, incidentally, have reached an employment level well above any peacetime peak ever recorded, during the week ending Sept. 13 figures showing total employment in the U. S. of close to 313,000, compared with 291,808 in June, 1941, highest previous record. Of the new high total, 254,000 are hourly rated and 59,000 salaried, and in the former group approximately 12 per cent are women. Employment continues to gain at a rate of around 4000 a week.

Hours worked per week also are at a new high level, for the week ending Sept. 13 being 46, compared with 38.8 hours in the corresponding week a year ago, or an increase of nearly 19 per cent.

Deliveries of war materials from GM plants in the U. S. and Canada for August totaled $205,667,029, increase of 31 per cent over July and bringing total deliveries this year just short of a billion dollars. This is two and a half times the deliveries of war products in 1941.

Salvage representatives of the motor industry met at dinner last week to review results of intensified industrial scrap collection efforts since June 1, to listen to comment by Bureau of Industrial Conservation officials from Washington, and to lay the groundwork for a still further concentrated program in the weeks ahead.

In the scrap drive which began in June, a three-month survey reveals a total return of 337,000 tons of metal scrap from motor industry plants, this being exclusive of metal used in furnaces and foundries operated by the plants themselves. Motor vehicle, body, parts and tool and die companies collected and shipped 297,000 tons of production scrap in the June-August period, in addition to 40,000 tons of dormant scrap obtained from obsolete buildings, machines and tools. Of the total haul, 319,000 tons were iron and steel, 18,000 tons nonferrous metals. In addition, reporting companies released for scrap more than 5500 tons of material held by their vendors.

In a new statement of scrap and salvage policy the industry has pledged the scrapping of all tools, dies and fixtures used in production of replacement parts where demand indicates such tools, dies and fixtures are no longer necessary for maintenance of essential transportation facilities. This is another step beyond the policy enunciated in June, and will result in more production equipment going to the scrap pile. It is manifestly unfair to narrow down retention of tools and dies by the date of a model year, because of variation in manufacturing policy between companies.

This much can be said about scrapping of equipment in the auto industry: The industry realizes perhaps even better than government salvage officials do the need for scrap. It also knows, or at least is in a position to know, the utility of tools, dies and equipment in inventory. There is no person or group in better position to weigh these two factors than the industry itself. Rest assured iron and steel will be consigned to scrap the moment its utility has been disproved.

Public collection of scrap in the Detroit area a week ago resulted in one of the motliest collections of junk imaginable, but still totaling in excess of 10,000 tons. The collection was adjudged an overwhelming success, but it might be pointed out that even if all the material were suitable for open-hearth furnace charging—and certainly not over 90 per cent of it was—the available tonnage would be sufficient to fill the needs of one local steel mill for only four or five days.

REPLACE FORGING WITH TUBING TO CONSERVE STEEL

ADAPTATION of automotive production methods to armament manufacture is resulting in savings of appreciable quantities of critical materials. Typical example is this part for an antiaircraft gun, formerly machined from a 56-pound solid steel forging, resulting in 50 pounds of scrap steel. Engineers replaced the forging with a 14-pound piece of steel tubing, welded to a forged base, with the result only 8 pounds of scrap. The two piles of scrap turnings show the difference between the old and new methods

Must it be "special"?

Information supplied by "Steel"

Almost every day a few plants working on war orders are compelled to curtail operations because needed material has not been received. This may mean that there is an actual shortage or — more likely — it may mean that in the great complexity of the war production program it has been impossible to distribute the right kind of material to the right place at the right time.

Whether the cause is real shortage or faulty distribution, every manufacturer can help remedy the situation by simplifying his material requirements as much as possible. A careful study may show that iron, steel or non-ferrous metals of standard analysis, size, gage, shape, tolerance, finish, or other specification can be used in some instances where material of "special" characteristics now is being employed.

If every war contractor could contrive to shift as little as 5 per cent of his present material orders from "special" to standard specifications, the result would be a greater flexibility in supply, which in turn would facilitate appreciably the flow of the right material to the right place at the right time. It is up to all manufacturers to investigate their specifications to this end.

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"Ghost Towns" Hold Many Tons of Scrap

Old mining equipment in Colorado now only accessible by truck; Will government help?

BELIEVING there is a larger tonnage of steelmaking scrap in the Colorado mountains, Colorado Fuel & Iron Corp., Denver, sent out "a scrap prospector" with camera on a searching expedition.

That the belief was well founded is proved by the pictures he obtained, a few of which are presented on this and following page. "The scrap is there, and the steel company's furnaces need it badly," it is reported. The chief difficulty in obtaining it is the heavy cost of reclaiming and transporting, far over ceiling prices which may be paid by the melter.

The area covered in the reconnaissance formerly was the site of many mining camps, long since abandoned. It includes the Central City, Black Hawk, Russell Gulch and Idaho Springs districts. The equipment, mainly heavy steel machinery, was shipped in by railroad, which were built to carry out gold and silver. After the mines ceased to operate, the tracks were removed and the only access at present is by motor highways.

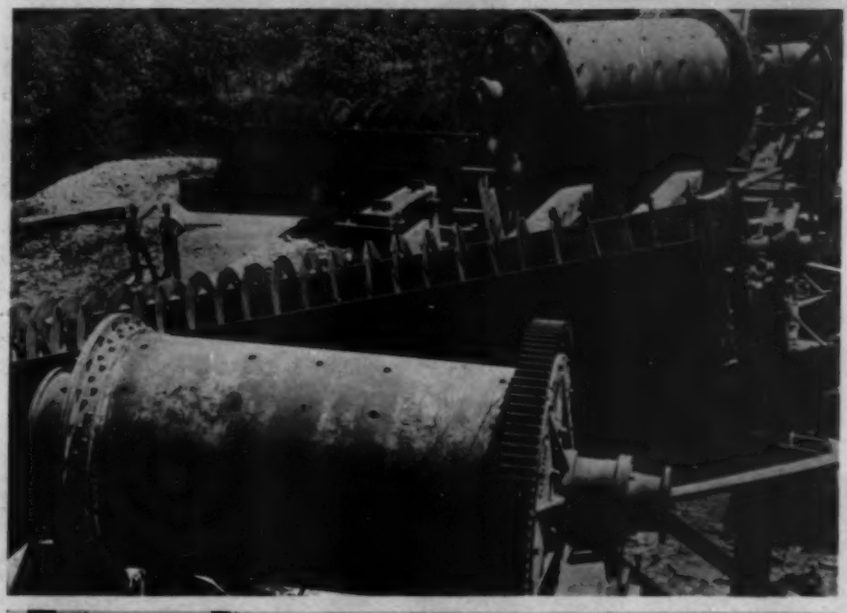
Recovery Cost High

This complicates the problem of removing the scrap. It must be broken or cut to sizes that can be transported by motor truck, carried 50 miles or more to the nearest points of preparation, there graded, loaded and shipped by rail to the steel mills at Minnequa, Colo. The overall cost is estimated to equal, and usually to exceed, ceiling prices of the grades it will make. Examination of the photographs indicates the resulting scrap would be of the highest grade and forms a most tempting source of material.

The company has sent a report to Washington, illustrated with many photographs, and is seeking assistance in moving the material to enable it to buy at ceiling prices.

The company has a surplus of slightly more than one month's supply of scrap. It is striving to accumulate a stock of 100,000 tons by Nov. 1 to insure uninterrupted operation through the winter. Current receipts are insufficient to support present schedules.

The problem is to provide dealers with methods of removing the remote scrap at a price below the ceilings, with a combination truck and rail haul, double



Thousands of tons of good scrap were found by the Colorado Fuel & Iron Corp.'s "prospector" recently, but the problem is how to get it out, since railroad tracks were removed when mining towns were abandoned. The photos—from a collection of a score or more—were made within 50 miles of accessible reclamation points. A considerable portion of the old equipment will have to be cut up before moving by truck

—o—

handling and in many instances preparation at both the point of origin and prior to freight car loading. The only solution in sight, under the ceiling price plan, the company states, seems to be financial assistance by War Materials Inc., organized recently to absorb excess cost in salvaging essential material.

In Washington it was learned by STEEL, that the problem is considered to be complicated by "pressing need for full-time mine operations in order to make available maximum quantities of metallics for the war production effort." Recently there has been difficulty in getting repair parts for mining machinery and equipment. Hence, it is the prevailing thought that no mining equipment should be scrapped unless it has been inspected by a United States Bureau of Mines engineer and approved for conversion to scrap. It is hoped that much of the idle mining equipment will serve as a reservoir for procurement of repair parts.

Weir Calls for Still Broader Scrap Drive

PITTSBURGH

There is still a lack of understanding of the scrap problem and its seriousness in high places, both in government and in industry, according to E. T. Weir, chairman, National Steel Corp. Although some plants apparently now have adequate supplies, the availability will decline as winter comes on. The real test may come in the following winter when non-recurring sources of scrap have been cleaned up, Mr. Weir stated.

What is necessary now is "a universal drive to arouse public consciousness of this program and the need for scrap, not only from homes, but from every point at which it can be found."

Citing Weirton Steel as an example, he said producers are still digging into their scrap reserves instead of building up accumulations.

Regarding substitution of pig iron for scrap in production of steel, Mr. Weir indicated that "every pound of metal, either in the form of scrap, pig iron or

(*Please turn to Page* 308)

A full year ahead of schedule, the new aircraft carrier LEXINGTON *slid down the ways last week at the Quincy, Mass., yards of Bethlehem Steel Co. Survivors of the old* LEXINGTON, *sunk five months ago in the Coral sea, witnessed the launching. NEA photo*

Merchant Vessel Program "On Time"

ATTAINMENT of the shipbuilding goal of 8,000,000 tons during 1942 and 16,000,000 tons in 1943 appears reasonably certain of accomplishment, according to Rear Admiral Emory S. Land, chairman of the Maritime Commission.

Admiral Land said American yards now are producing at the rate of three ships a day—90 in September aggregating about 1,000,000 tons. Production time for Liberty ships has been reduced from an average of 241.8 days for all yards in January to 70 days in September.

"These records indicate still further reduction in average production rate," the admiral predicted.

Noteworthy among new ship construction records was the feat of Henry J. Kaiser's Portland, Oreg., yard in launching a 10,500-ton cargo vessel ten days after the keel was laid. The sensational records achieved by the Kaiser yards on the West Coast in breaking speed record after speed record has been credited in part to his possession of huge cranes which permit the assembly of large prefabricated sections.

Admiral Land is reporting to President Roosevelt on the first anniversary of the launching of a Liberty ship, said that 488 vessels had been delivered, aggregating 5,450,000 deadweight tons. Of these, 327 were Liberty vessels, 49 C-type cargo ships, 51 tankers, 5 ore carriers, and 56 cargo ships for private and British account.

Since January, 1941, the admiral said, shipyard capacity for the production of ocean-going merchant ships has been more than tripled, and the United States production now is considerably more than that of all other countries combined. This country has more than 60 yards and 700 plants in nearly all states are producing ship materials.

Twenty thousand workers from the New York labor market are being recruited by the Henry J. Kaiser organization for employment in his West Coast shipyards where records for speed in shipbuilding fall steadily. Lower left, some 500 of the easterners clamber aboard a special train in Hoboken, N. J., for the trip west. At right, a keel is laid in the Kaiser yard at Portland, Oreg., where a 10,500-ton Liberty ship recently was launched 10 days after the keel laying. NEA photos

Col. J. S. Seybold, United States Army, presents the production award to H. K. Porter Co. Inc., Pittsburgh, 76-year-old manufacturer of locomotives, now working 100 per cent on locomotives and other ordnance equipment for the United Nations. President T. M. Evans, at speaker's stand, receives the award for management; John Thiery, employe since 1894, accepts for workers. (Right)

August H. Tuechter, president, Cincinnati Bickford Tool Co., receives floral tribute on behalf of company directors from J. Schmudde, representing employes, at presentation of Army-Navy pennant to the firm. Looking on are Comm. H. Mosler, Navy; Col. F. A. McMahon and Lieut. Col. W. R. Martin, Army (below)

Employes cheer presentation of the "E" burgee to William Sellers & Co. Inc., Philadelphia, 94-year-old builder of machine tools. Holding the pennant are Maj. R. G. Allen, United States Army; Comm. J. F. Cleary, Navy; Eugene C. Clarke, president of the company, and Carl L. Wright, chairman of the employes' shop committee

More Firms Receive Production Pennants

Inspiration Consolidated Copper Co., Inspiration, Ariz.
Magma Copper Co., Superior, Ariz.
Miami Copper Co., Miami, Ariz.
Phelps Dodge Corp., Morenci Branch, Morenci, Ariz.; United Verde Branch, Jerome, Ariz.; New Cornelia Branch, Ajo, Ariz.
Kennecott Corp., Nevada Consolidated Corp., Ray, Ariz.
Aberfoyle Inc., Norfolk, Va.
Accurate Brass Co. Inc., Glendale, Long Island, N. Y.
Bonney Forge & Tool Works, Allentown, Pa.
Briggs Mfg. Co., Detroit.
Cessna Aircraft Co., Wichita, Kans.
Corbin Screw Corp., New Britain, Conn.
Couse Laboratories Inc., Newark, N. J.
Electric Auto-Lite Co., Toledo, O.
Federal Motor Truck Co., Detroit.
Ford Motor Co., Chester, Pa.
General Steel Castings, Granite City, Ill.
North American Aviation Inc., Inglewood, Calif.
North American Aviation Inc., Dallas.
O'Connor Machine Co., Sheffield, Pa.
Osgood Co., Marion, O.
Vultee Aircraft Inc., Vultee Field, Calif.
Westinghouse Electric & Mfg. Co., Baltimore.
American Tool Works Co., Cincinnati
Bausch & Lomb Optical Co., Rochester, N. Y.
Diamond-T Motor Car Co., Chicago.
Specialty Screw Machine Products Co. Lancaster, Pa.
Electro-Metallurgical Co., Niagara Falls.
Burgess-Norton Mfg. Co., Geneva, Ill.
American Zinc Co. of Illinois, Monsanto plant, Monsanto, Ill.
Budd Wheel Co., Detroit.
Colorado Fuel & Iron Corp., Pueblo, Colo.

Equality of Pay Granted to Them by Labor Board

"EQUAL pay for equal work" by women in war industries was adopted in principle last week by the National War Labor Board in an opinion handed down in a case involving Brown & Sharpe Mfg. Co., Providence, R. I.

The board in an unanimous decision ruled "there should be no discrimination between employes of equal ability employed on similar work where production is substantially the same."

The decision was regarded by labor officials as of comparable importance to that in the "Little Steel" case fixing wage raises at 15 per cent above January, 1941, levels, and the ruling in the Marshall Field case establishing the union maintenance-of-membership principle.

Added importance was attached to the decision by the influx of women workers into war industries as result of greatly expanded production and the induction of large numbers of men workers into the armed forces.

—o—

Seventy-eight per cent of the employes in Allis-Chalmers Mfg. Co.'s new supercharger plant, recently dedicated at Milwaukee, are women. Brig Gen. K. B. Wolfe, Wright Field, Dayton, O., and Walter Geist, Allis-Chalmers president, are shown at upper right watching one of the hundreds of women workers inspecting an impeller wheel. Speaking at the dedication, General Wolfe termed the superchargers to be built in the plant an "ace in the hole" which will permit American bombers to fly far above enemy antiaircraft fire

—o—

Woman worker operates a General Electric magnetic switch to control the movement at an aerial tram at the London Mines & Milling Co. gold and silver mine near Alma, Colo.

Poster issued by the War Manpower Commission emphasizes the importance women are assuming in the war production effort

Industrial Activity Steadily Advancing

INDUSTRIAL activity moved steadily upward throughout September, reflecting expanding output of war industries. STEEL's weekly index averaged 174.8 last month, to reach a new monthly peak. In the preceding month the index averaged 173.5. Since the first of the year the monthly index average has advanced 9.1 points.

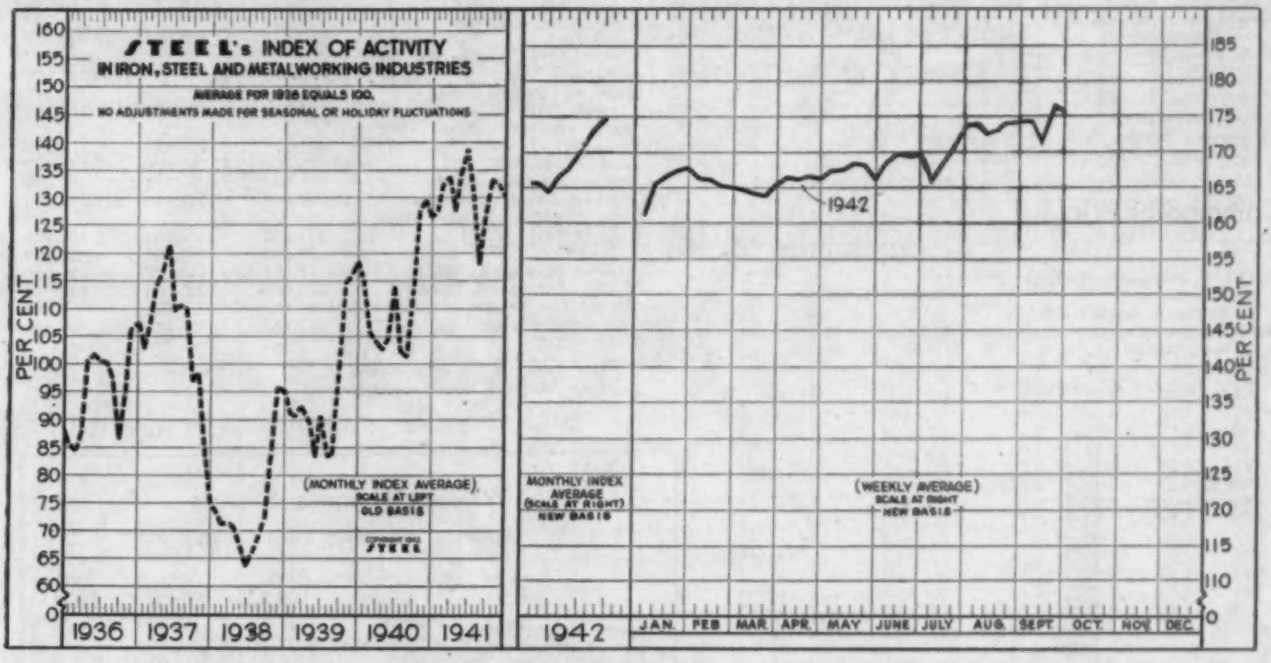
For the week ended Sept. 26 the index eased 0.8 to 176.0, due to a slight decline in revenue freight carloadings and electric power consumption.

During the latest period electric power output declined from the all time peak recorded in the preceding week. Compared with a year ago power consumption is up 13.7 per cent.

Early estimate of revenue freight carloadings for the week ended Sept. 26 shows a moderate decline to slightly below 900,000 cars. In the preceding week freight traffic had reached the highest level recorded this year of 903,099. Number of cars loaded during the summer months were below that reported last year. In this connection it is interesting to note that the Midwest Shippers Advisory Board estimates that in the final three months this year carloadings will be 7.6 per cent above that recorded in same period of 1941.

Steel ingot production during the week ended Sept. 26 held unchanged at 98 per cent for the fifth consecutive weekly period. So far this year the national steel rate has fluctuated between the narrow range of 95.5 and 99 per cent. Iron and steel scrap collections have improved.

Shortage of manpower is expected to soon become as important a factor in hampering production as raw material shortages are currently. This situation is expected to result in a sharp increase in the employment of women on jobs previously thought impossible for them to handle;



STEEL's index of activity declined 0.8 points to 176.0 in the week ending Sept. 26:

Week Ended	1942	1941
July 25	173.6	132.9
Aug. 1	173.8	123.3
Aug. 8	172.8	117.5
Aug. 15	173.5	118.2
Aug. 22	174.0	118.5
Aug. 29	174.5	118.2
Sept. 5	174.8	111.8
Sept. 12	171.2	131.3
Sept. 19	176.8	130.6
Sept. 26	176.0†	132.0

†Preliminary.

Mo. Data	1942	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931
Jan.	165.7	127.3	114.7	91.1	73.3	103.9	85.9	74.2	58.8	48.6	54.6	89.1
Feb.	165.6	132.3	105.8	90.8	71.1	106.3	84.3	82.0	73.9	48.2	55.3	75.5
March	164.6	133.9	104.1	92.6	71.2	114.4	87.7	83.1	78.9	44.5	54.2	80.4
April	166.7	127.2	102.7	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8	81.0
May	167.7	134.8	104.6	83.4	67.4	121.7	101.8	81.8	83.7	63.5	54.8	78.6
June	169.4	138.7	114.1	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1
July	171.0	128.7	102.4	83.5	66.2	110.4	100.1	75.3	63.7	77.1	47.1	67.8
Aug.	173.5	118.1	101.1	83.9	68.7	110.0	97.1	76.7	63.0	74.1	45.9	67.4
Sept.	174.8	126.4	113.5	98.0	72.5	96.8	86.7	69.7	56.9	68.0	46.5	64.3
Oct.	....	133.1	127.8	114.9	83.6	98.1	94.8	77.0	56.4	68.1	48.4	59.2
Nov.	....	132.2	129.5	116.2	95.9	84.1	106.4	88.1	54.9	52.8	47.5	54.4
Dec.	....	130.2	126.3	118.9	93.1	74.7	107.6	88.2	58.9	54.0	46.2	51.8

Note: Weekly and monthly indexes for 1942 have been adjusted to offset the forced curtailment in automobile production and to more accurately reflect expanding steel production.

and the development of greater control over every person's job.

WPB reports output of munitions was 8 per cent above July but 14 per cent below the earlier forecast for the month. Board's index stood at 357 for August, compared with revised July index figure of 330. In August 1941 and 1940 the index stood at 72 and 22 respectively.

Aircraft production during August was up 6 per cent over July; Ordnance, 8; naval ship construction, 7; Merchant shipbuilding, 6; and other munitions, 14 per cent.

August output of machine tools advanced to $117,400,000, a gain of 3.3 per cent over July. Total production for eight months period amounted to $819,100,000, compared with the record 1941 output of $771,400,000. A peak plateau in monthly production is expected to be reached in the near future. The plant facilities program is being curtailed to make it possible for a greater volume of raw materials to be thrown into production.

BUSINESS BAROMETER

Financial Indicators

	Aug., 1942	July, 1942	Aug., 1941
30 Industrial Stocks†	106.05	106.94	126.67
20 Rail Stocks†	26.19	25.63	30.19
15 Utilities†	11.51	11.75	18.50
Value of Bonds (N.Y.S.E.)	$62,720	$61,277	$53,216
Bank Clear'gs daily average (000 omitted)	$1,120,946	$1,170,985	$1,020,137
Commercial Paper, interest rate, % (4-6 months)	0.69	0.69	0.50
Com'l loans (000 omitted)*	$10,382,000	$10,696,000	$9,861,000
Federal Reserve ratio (per cent)	86.5	87.1	91.0
Capital flotations (000 omitted)			
New Capital	$103,072	$40,679	$361,029
Refunding	$58,573	$101,472	$111.394
Federal gross debt. (mil. of dol.)	$81,635	$77.136	$50 936
Railroad earnings†	$133,001,365	$118,730,968	$106,381,904
Stock sales, New York Stock Exchange	7,387,341	8,373,550	10,874,650

†Dow Jones series.
*Leading member banks Federal Reserve System.
‡July, June and July respectively.

Commodity Prices

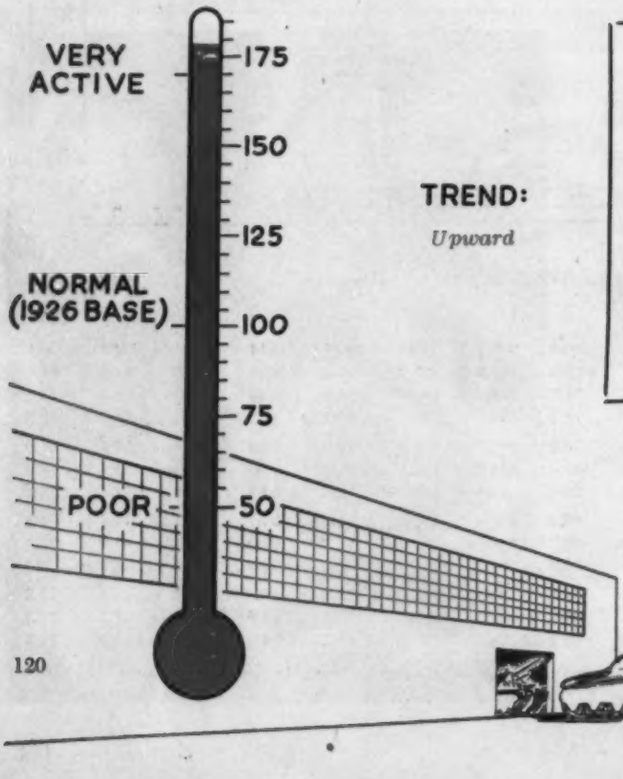
	Aug., 1942	July, 1942	Aug., 1941
STEEL'S composite finished steel price average	$56.73	$56.73	$56.73
U. S. Bureau of Labor's index	98.8	98.7	90.3
Wheat, cash (bushel)	$1.29	$1.268	$1.14
Corn, cash (bushel)	$1.045	$1.013	$0.845

†July, June and July respectively.

Industrial Indicators

	Aug., 1942	July, 1942	Aug., 1941
Munitions Output Index (WPB)†	350	303	64
Commerce Dept.'s Mfgs. Index†:			
Orders	253	314	196
Shipments	207	202	168
Inventories	174.7	172.9	140.0
Iron and Steel Scrap consumption (tons)	4,645,000	4,600,000	4,518,000
Gear Sales Index	380	344	276
Machine Tool Output†	$113,600,000	$111,100,100	$57,900,000
Foundry equipment new order index	510.8	800.8	312.9
Finished steel shipments (Net tons)	1,788,650	1,765,749	1,753,665
Ingot output (average weekly; net tons)	1,632,833	1,617,381	1,579,570
Dodge bldg. awards in 37 states ($ Valuation)	$721,028,000	$943,796,000	$760,233,000
Fabricated structural steel shipments (Tons)	165,212	182,626	189,251
Steel castings output (Net Tons)‡	131,458	131.492	113,988
Coal output, tons	47,160,000	47,700,000	46,651,000
Business failures; number	698	764	954
Business failures; liabilities	$6,781,000	$8,548,000	$11,134,000
Coke Production (Daily Ave.)			
By-product	171,443	170,244	161,900
Beehive	22 258	22.197	20 800
Cement production, bbls.†	16,833	16,022	16,000
Cotton consumption, bales	925,089	995,041	872,035
Freight Car Awards	0	1,025	2,668
Car loadings (weekly av.)	871,855	858,019	897,848

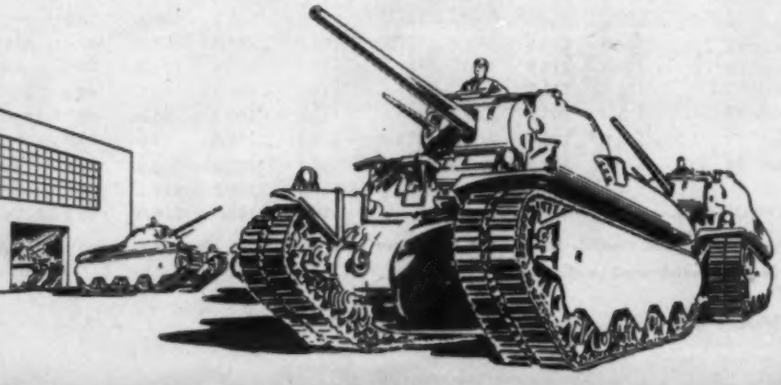
†July, June and July respectively.
‡June, May and June respectively.

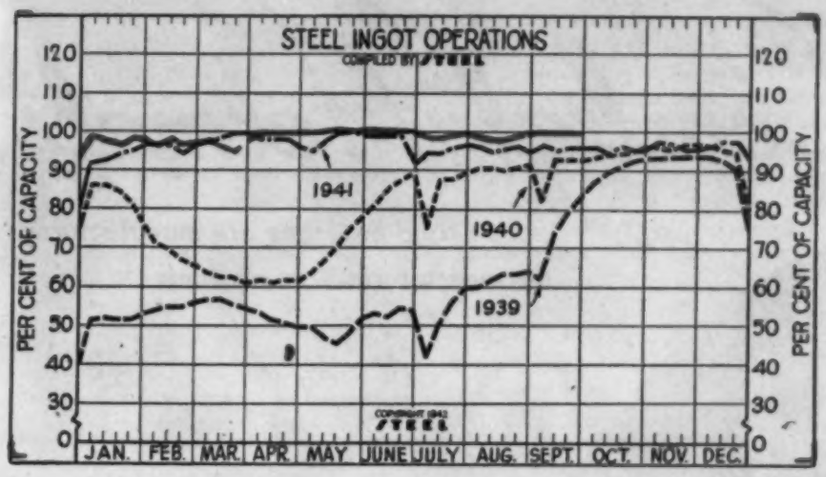


Where Business Stands

Monthly Averages 1941 = 100

	Aug. 1942	July 1942	Aug. 1941
Steel Ingot Output	102.7	101.7	99.3
Finished Steel Shipments	104.9	103.6	102.9
Structural Steel Shipments	88.1	96.6	100.8
Building Construction	144.0	188.5	151.8
Wholesale Prices	113.2	113.1	103.4
Freight Carloadings	107.2	105.5	110.4





Steel Ingot Operations

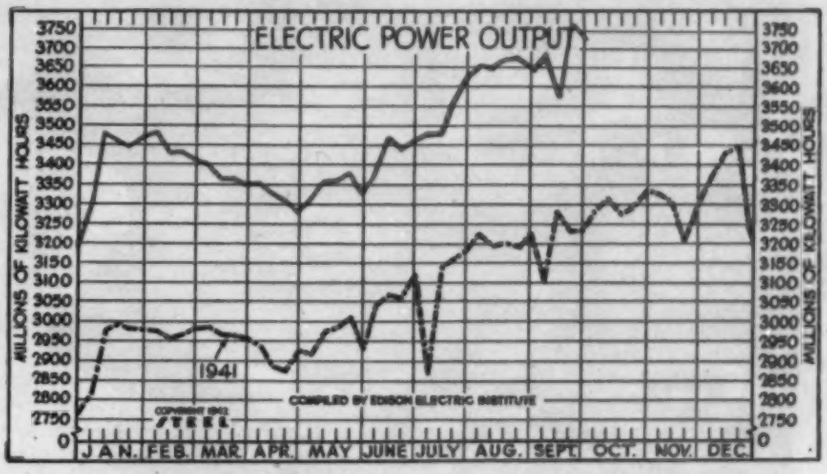
(Per Cent)

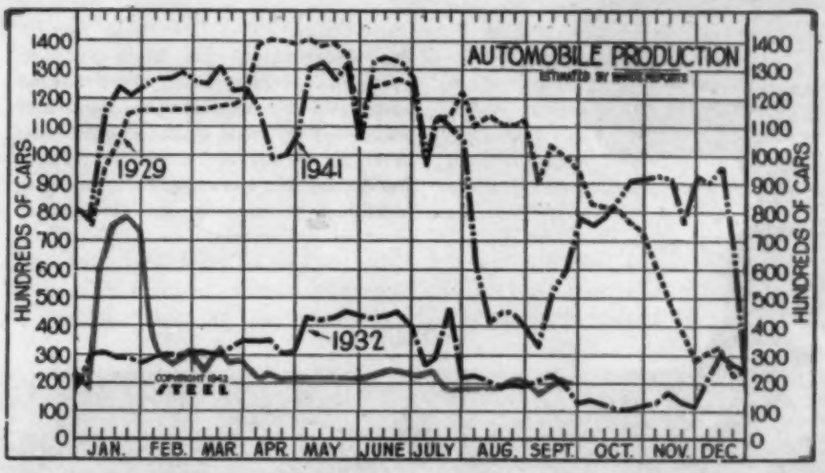
Week ended	1942	1941	1940	1939
Sept. 26	98.0	96.0	93.0	84.0
Sept. 19	98.0	96.0	93.0	79.5
Sept. 12	98.0	96.5	93.0	74.0
Sept. 5	98.0	95.5	88.0	68.0
Aug. 29	96.0	96.5	91.5	64.0
Aug. 22	97.5	96.0	90.5	63.5
Aug. 15	97.0	95.5	90.0	63.5
Aug. 8	97.5	96.5	90.5	62.0
Aug. 1	98.0	97.5	90.5	60.0
July 25	96.5	96.0	89.5	60.0
July 18	98.0	95.0	88.0	56.5
July 11	97.5	95.0	88.0	50.5
July 4	97.5	92.0	75.0	42.0
June 27	98.5	99.5	89.0	54.0
June 20	99.0	99.0	88.0	54.5
June 13	99.0	99.0	86.0	52.5
June 6	99.0	99.0	81.5	53.5

Electric Power Output

(Million KWH)

Week ended	1942	1941	1940	1939
Sept. 26	3,720	3,233	2,816	2,559
Sept. 19	3,757	3,232	2,769	2,538
Sept. 12	3,571	3,281	2,773	2,532
Sept. 5	3,673	3,096	2,592	2,376
Aug. 29	3,640	3,224	2,736	2,442
Aug. 22	3,674	3,193	2,714	2,434
Aug. 15	3,655	3,201	2,746	2,454
Aug. 8	3,649	3,196	2,743	2,414
Aug. 1	3,649	3,226	2,762	2,400
July 25	3,626	3,184	2,761	2,427
July 18	3,565	3,163	2,681	2,375
July 11	3,429	3,141	2,652	2,403
July 4	3,424	2,867	2,425	2,145
June 27	3,457	3,121	2,660	2,396
June 20	3,434	3,056	2,654	2,362
June 13	3,464	3,066	2,665	2,341


ELECTRIC POWER OUTPUT
MILLIONS OF KILOWATT HOURS
1941
COMPILED BY EDISON ELECTRIC INSTITUTE
JAN. FEB. MAR APR MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.



Auto Production

(1000 Units)

Week ended	1942	1941	1940	1939
Sept. 26	20.9	78.5	96.0	62.8
Sept. 19	21.0	60.6	76.8	54.0
Sept. 12	19.6	58.2	66.6	41.2
Sept. 5	16.9	52.9	39.7	26.9
Aug. 29	21.1	40.0	27.6	25.2
Aug. 22	20.2	45.5	23.7	17.5
Aug. 15	19.2	45.6	20.5	18.0
Aug. 8	19.2	41.3	18.6	24.9
Aug. 1	18.8	62.1	17.4	28.8
July 25	18.8	105.6	34.8	40.6
July 18	17.9	109.9	56.9	47.7
July 11	23.0	114.8	65.2	61.6
July 4	22.7	96.5	52.0	42.8
June 27	22.9	127.9	87.6	70.7
June 20	23.2	135.6	90.1	81.1
June 13	22.8	134.7	96.6	78.3

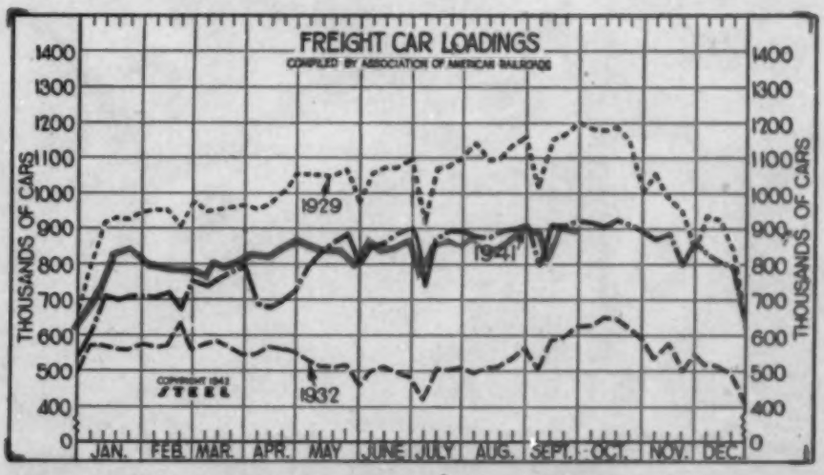
Figures since Feb. 21 last include Canadian trucks and automobiles and United States trucks.

Freight Car Loadings

(1000 Cars)

Week ended	1942	1941	1940	1939
Sept. 26	900†	920	822	835
Sept. 19	903	908	813	815
Sept. 12	815	914	804	806
Sept. 5	888	798	695	667
Aug. 29	899	913	769	723
Aug. 22	869	900	761	689
Aug. 15	869	890	746	674
Aug. 8	850	879	727	665
Aug. 1	864	883	718	661
July 25	856	897	718	660
July 18	857	899	730	656
July 11	855	876	740	674
July 4	759	741	667	559
June 27	853	909	752	660
June 20	840	886	728	643

†Preliminary.



New Combat Helmets

. . . . and how they are manufactured by mass-production methods

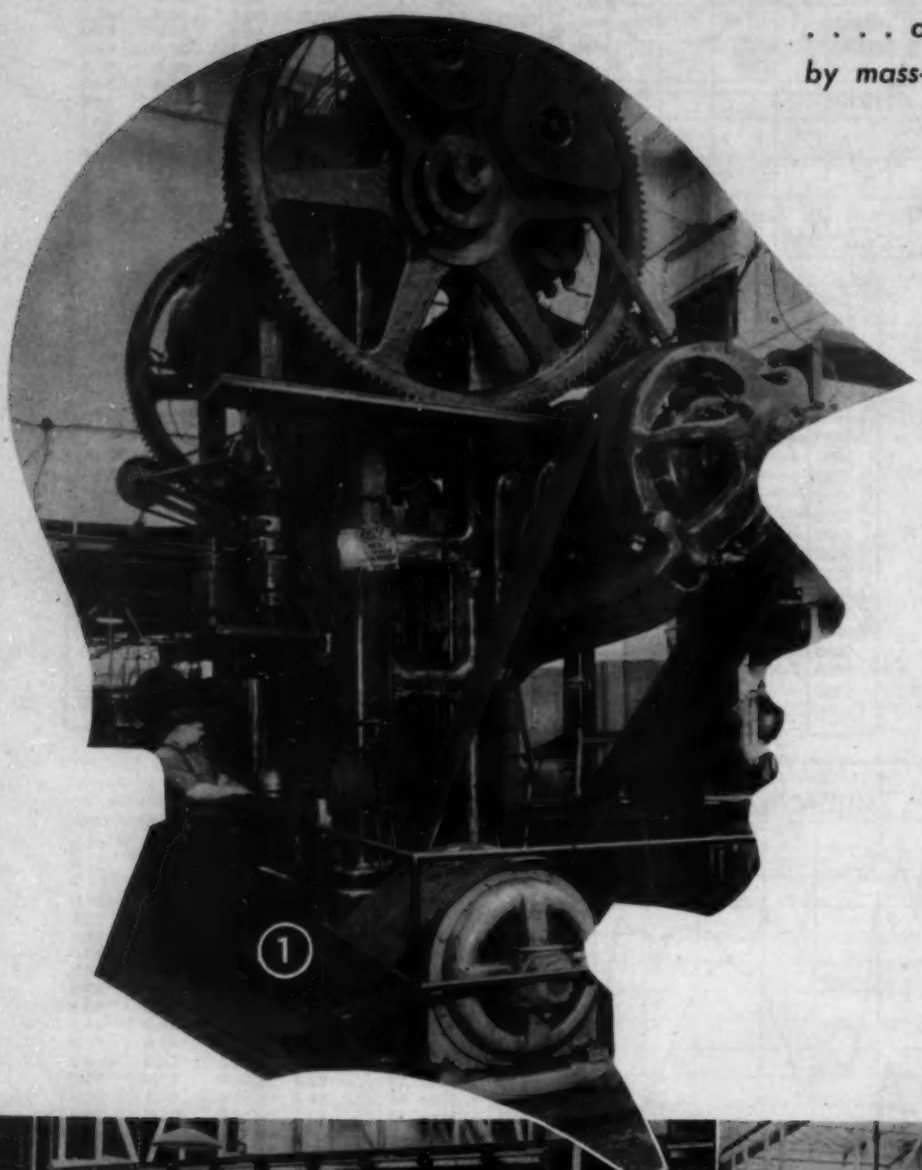


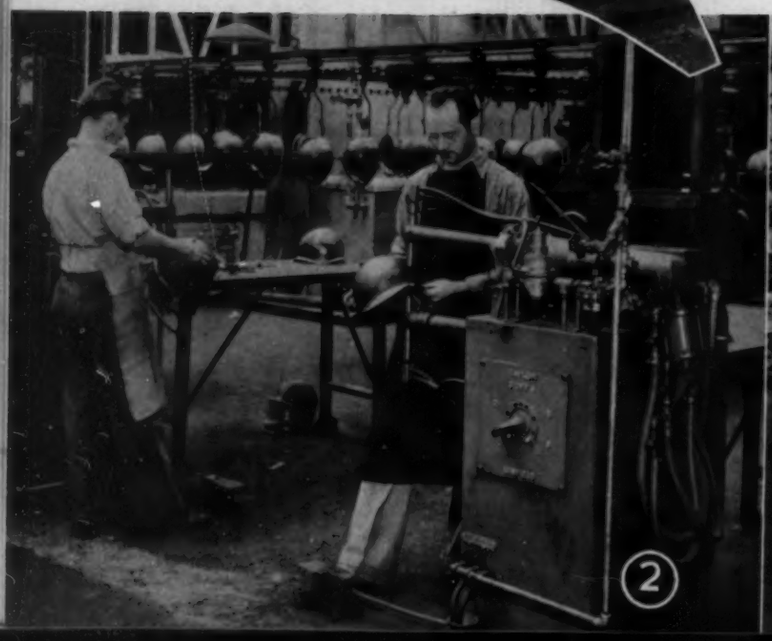
Fig. 1—Triple-die press of 500-ton capacity used in forming helmet from flat blank in one stroke

Fig. 2—Spot welding steel clips to hold chin strap on inside of formed helmet. Note conveyor line and special hooks to hold pieces in background

Fig. 3—Stainless steel strip is rolled into a channel-shaped bead and cut to proper length on these presses before being applied to brim of helmet

Fig. 4—Automatic paint spray setup for coating both inside and outside of helmets as they pass by on spindle conveyor

Fig. 5—Stitching chin straps to sides of molded helmet liner. Football-type suspension is riveted to these liners also and keeps the head of the wearer away from the surface of the helmet. These liners may be worn without the outer steel shell as protection against sun and weather



PICTURES of American forces landing on foreign soil in recent months show them to be equipped with an entirely new type of combat helmet, vastly different from the "tin hats" which doughboys wore in World War I. The latter is known as the "wash-basin" type of head armor or more technically as the M1917 type, standard equipment until late in 1940 when tests made in the light of events in Europe developed their inadequacies for a war of movement where missiles can come from all directions—even from below, as in the case of parachutists.

Problem of perfecting a new type of helmet was assigned the Infantry Board, which in an early report stated: "Research indicates that the ideal shaped helmet is one with a dome-shaped top and generally following the contour of the head, allowing sufficient uniform headspace for indentations extending down in the front to cover the forehead without impairing necessary vision, extending down on the sides as far as possible without interfering with the use of the rifle or other weapons, extending down the back of the head as far as possible without permitting the back of the neck to push the helmet forward on the head when the wearer assumes the prone position, with the frontal plate flanged forward to form a cap-style visor, and with the sides and rear slightly flanged outward to cause rain to clear the collar opening".

From these ambitious specifications the TS-3—now the M1—helmet was developed and is currently in mass production by McCord Radiator & Mfg. Co., Detroit. Well over a million of the helmets already have been produced.

In addition to the design specifications cited above, there are certain other essentials. The helmet must not be too heavy, maximum allowable weight, fully fitted, being 3 pounds. Certain minimum ballistic properties must be met. Resistance to penetration by a 230-grain, caliber .45 bullet with a velocity of 725 feet per second must be proved in firing tests. In common terms, the helmet must not be penetrated by a bullet from a service pistol fired at point-blank range. Further, the steel is nonmagnetic, presumably to avoid extraneous effects on certain types of electrical instruments operated by the field forces.

At the outset, it may be well to describe in detail just what the "helmet assembly" comprises. First is the one-piece outer steel shell, the edge of which is trimmed with a formed strip of stainless steel. On either side are welded clips to receive the chin strap. This protective shell fits tightly over a plastic molded liner in olive drab color and formed to the identical but slightly smaller shape of the steel shell.

Riveted to the liner is the hammock or football helmet type of suspension. It is made up of a narrow cloth band, around which are sewed six strips of fabric, looped over a tubular lacing ring at the top or dome of the liner. Headbands, adjustable for different-sized heads, are snapped inside the hammock at six points by metal snap fasteners. At the back of the liner is riveted another cloth strip known as the neck band which holds the wearer's neck away from contact with the liner. A chin strap also is provided. The liner weighs only a few ounces fully assembled and may be worn comfortably either with or without the closely fitting protective steel outer member. Naturally, combat requires the full assembly, but for protection against sun and weather, the light olive drab liner is ample. The suspension system keeps the wearer's head about 1½ inches away from front, back and sides of the liner.

Standard steel for helmets is Hadfield's manganese, an austenitic material which has the peculiar property of more than doubling in hardness as the result of cold work, and is of course nonmagnetic.

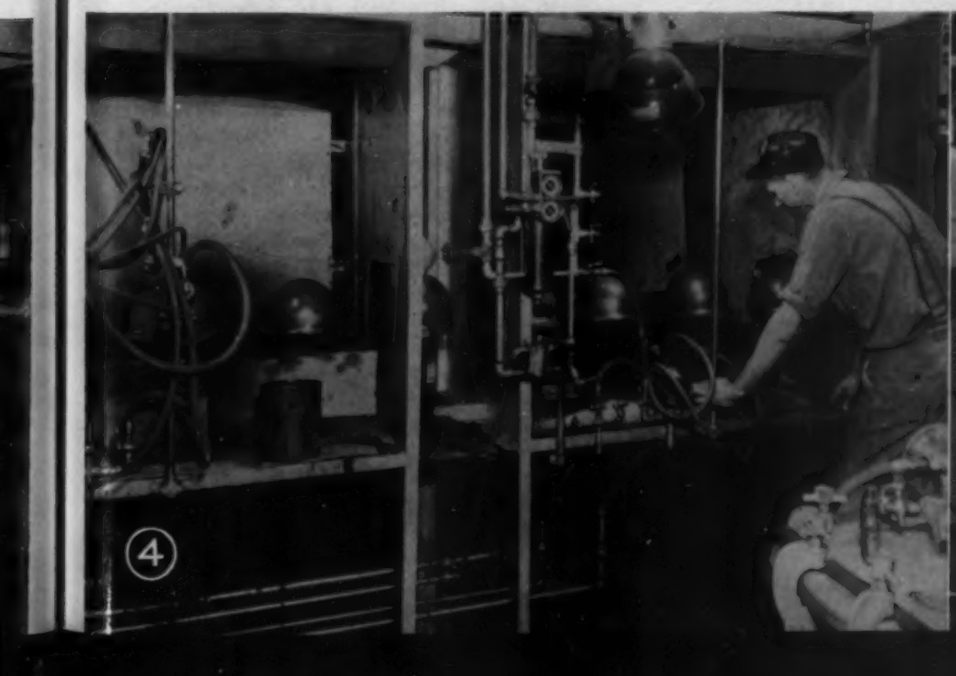
Hardness of the steel in the heat treated condition is 180 to 200 brinell. After cold working, this may increase to between 450 and 550, depending upon the degree of cold work.

Hadfield's manganese steel for helmets is made in the basic 100-ton open-hearth furnaces. Careful attention to processing steps between the ingot and the final sheet is essential. Ingots are reduced to slabs, breakdowns and finally to sheets which are reheated and rolled in packs of four on hand mills to a final product which is approximately 34 inches wide and 70 inches long. After pack rolling the steel sheets are austenitized, or heated up and quenched in cold water to insure carbides being kept in solid solution in the austenite. Bend tests, cupping tests, grain size determination, chemical checks for decarburization, and microscopic examinations are made, after which the sheets are roller leveled, pickled and reinspected.

Close control of rolling temperatures and constant inspection during the various rolling operations are essential. Individual sheets finally are marked off in 16½-inch circles, and the heat number stamped in each circle. The sheet then is slit down the center, leaving four circles in each length. The strips are cut into squares and then each blank trimmed out in a circling shears. Further inspection then is made, the blanks slushed with oil and packed 400 in a stack, crated and shipped to the fabricator. Weight of blank must be within the limits of 2.5 to 2.8 pounds.

First operation in forming the helmets is to stamp both heat number and shipment number at the edge of each blank. This is done in a small punch press, using a fine-line steel stamp. The marking carries through to the final

(*Please turn to Page 269*)



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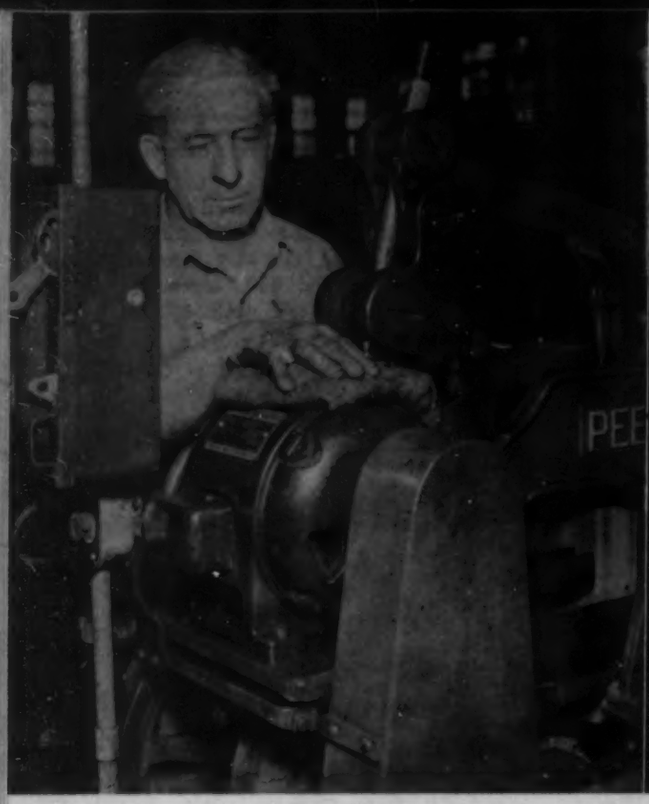


Left, motors will overheat if dirt and dust are allowed to accumulate. Frequent wiping is important. Note nameplate position for quick reading. Right, checking oil level in sleeve bearings frequently also important—especially with today's scarcity of bronze bearing metal

MOTOR MAINTENANCE— A "MUST"

By O. F. VEA
Motor Division
General Electric Co.
Schenectady, N. Y.

PRESENT-DAY conditions make it necessary to "baby" all electric motors. Maintenance pro rams must be intensified to prevent breakdowns, because 24-hour-a-day 7-day-a-week war production schedules cannot be interrupted—output lost today cannot be made up tomorrow. Even the failure of an inconspicuous piece of equipment can cause a considerable disruption in production.

On the other hand, industrials engaged in nonwar activities must "keep 'em turning" as long as possible because of the difficulty in obtaining new motors without the necessary priority rating. Therefore an effective general maintenance program such as is outlined here is of particular importance. Wherever available the specific instruction sheet accompanying each motor should be followed.

Check motor foot bolts and end-shield bolts every six months to make sure that they are securely fastened. Loose mountings can cause misalignment, break motor feet

Selection and Installation: A real maintenance program begins with selection. Motors must be chosen that are properly rated and protected for their work. The selection involves a study of requirements, such as continuous or intermittent duty, starting, torque, speed regulation, and the like. These all have a bearing on just what type of motor to choose.

In addition, the environment in which the motor is to operate should be considered, as this determines whether an open motor or some form of enclosed motor should be used, and how the motor should be located with respect to the driven load.

The next point to be considered is installation. The most important items from the standpoint of long, trouble-free life for a motor follow. The motor should be located in such a way that it is accessible for inspection and repairs. Of course, it is always advisable to install the motor in a place free from adverse conditions unless it is built in a protecting enclosure. It is also important to see that the motor has ample ventilation so that heat losses will be carried away.

A standard motor should not be installed where the ambient temperature or normal temperature rise is more than 40 degrees Cent. The motor should be installed on a solid foundation which is free from vibration. If it is direct-connected or belted, care should be taken to secure proper alignment, which should permit rotor end-play within reasonable limits.

All these factors must be taken into consideration if inspection and maintenance are not to be discouragingly difficult.

Connecting the Motor: All electrical connections to a motor should be made tightly enough so that the vibration of the equipment will not loosen them. Wires joined in a conduit box should be either twisted together and soldered, or bolted together. These joints should be wrapped first with rubber tape, and then with friction tape.

Wires issuing from a conduit box, especially rubber-covered extension cords, should be held in some way so that there is no strain on the connections themselves. Usually a knot in the wire inside the conduit box, or the use of conduit-box fittings that grip the wire where it leaves the box, are the most convenient ways to obtain this strain relief.

Starting the Motor: A little extra care when starting a motor for the first time is a good investment. For example, trouble may be avoided by a look at the brushes of a direct-current or single-phase repulsion motor to make sure that they are seating properly on the commutator, and with the proper pressure. It is always good practice to turn the motor over by hand before applying power to be sure that it turns freely, and that no foreign materials or objects have fallen into the motor during shipment or handling.

Inspection: When the motor has been properly selected, installed, and connected, the maintenance program really begins. To insure efficient operation and maximum production, inspection and servicing should be systematic.

Frequency of inspection and degree of thoroughness vary, and will have to be determined by the maintenance engineer. They will be governed by (1), the importance of the motors in the production scheme (that is, if the motor fails, will the whole works be shut down?); (2), percentage of time the motor operates; (3) nature of service; (4), environment.

An inspection schedule must, therefore, be elastic and adapted to the needs of each plant. The following schedule, covering both alternating and direct-current motors, is based on average conditions so far as duty and dirt are concerned:

Every Week:

—Examine commutator and brushes
—Check oil level in bearings
—See that oil rings turn with shaft
—See that shaft is free of oil and grease from bearings
—Examine starter, switch, fuses, and other controls
—Start motor and see that it is brought up to speed in normal time.

Every Six Months:

—Clean motor thoroughly, blowing out dirt from windings and wipe commutator and brushes
—Inspect commutator clamping ring
—Check brushes and renew any that are more than half worn
—Examine brush holders and clean them if dirty. Make sure that brushes ride free in the holders.
—Check brush pressure
—Check brush position
—Drain, wash out, and renew oil in sleeve bearings
—Check grease in ball or roller bearings
—Check operating speed or speeds
—See that end play of shaft is normal
—Inspect and tighten connections on motor and control
—Check current input and compare with normal
—Run motor and examine drive critically for smooth running, absence of vibration, worn gears, chains, or belts
—Check motor foot bolts, end-shield bolts, pulley, coupling, gear and journal setscrews, and keys
—See that all motor covers, belt and gear guards are in good order, in place and securely fastened

Once a Year:

—Clean out and renew grease in ball or roller bearing housings
—Test insulation by megger
—Check air gap
—Clean out magnetic dirt that may be hanging on poles
—Check clearance between shaft and journal boxes of sleeve-bearing motors, to prevent operation with worn bearings
—Clean out undercut slots in commutator
—Examine connections of commutator and armature coils
—Inspect armature bands

Records: The competent maintenance man will have a record card for every motor in the plant. All repair work, with its cost, and every inspection can be entered on the record. In this way, excessive amounts of attention or expense will show up and the causes can be determined and corrected.

(*Please turn to Page* 271)

The competent maintenance man will have a record card for every motor in the plant, and a record will be made of all servicing and repairs. Here are both sides of a suitable card

H.P.	Syn. Speed	Make	Connection Diagram	Application	Shop or Mill No.	Card No.

Type	Frame	Poles	F. L. Speed	Volts	Form	Temp. Rating	F.L. Amp.	Phase	Cycles

Serial No.
Model No.
Publication No.

CONTROL EQUIPMENT

Type	Make	Pub. No.

BRUSHES
No. Per Motor
Cat. No.
Size
Material
Grade

LININGS
Front End, Cat. No.
Pulley End, Cat. No.

COILS
(Cat. or Spec. No.)
Stator or Field
Main
Comm.
Comp.
Rotor or Armature
Coils
Bars
No. per Set

Connection Diagram

PULLEY
Diam.
Face
Belt Width
Bore
Keyway

Mfr's Order No.
Our Order No.
Date of Order
Cost { Motor / Control

User:
Location:

SERVICE RECORD

Date	Building	Floor	Driving	Drive	Tested Hp.

REPAIRS

Date	Condition	Due to	Repaired by	Cost

GENERAL ELECTRIC SERVICE SHOPS
are located in the following cities:

Atlanta				
Buffalo	Dallas	Kansas City, Mo.	Philadelphia	San Francisco
Charleston, W. Va.	Detroit	Los Angeles	Pittsburgh	Schenectady
Chicago	Erie	Milwaukee	Pittsfield	Seattle
Cincinnati	Fort Wayne	Minneapolis	St. Louis	West Lynn (River Works)
Cleveland	Houston	New York	Salt Lake City	West Lynn (West Lynn Works

Highly finished steel products, such as cold drawn shell rounds shown in this view, can be coated with Carbozite black in the shop for protection during shipment and storage. No other protection is required

TEMPORARY PROTECTIVE COATING

. . . . permits steel to be shipped in open gondola cars—expands storage possibilities as steel so protected can be stored in the open

SEVERAL new protective coverings for metal, independent of supplies of imported or strategic raw materials, have been developed through researches on Wurtzilite, a pyrobituminous ore occurring naturally in some of our western states. Much of this work has been done by the Carbozite Corp., Pittsburgh.

The application that is probably of the greatest immediate importance is a series of shop coats—coats, applied for temporary protection of steel surfaces on bars and shafting during shipment or in storage. Known as "Carbozite", this material prevents corrosion from moisture and other elements in the atmosphere. As a result, it is especially important during the present shortage of packing materials, freight cars and cargo space for it provides the protection against exposure needed for shipping and storing steel in the open.

Steel covered with this coating can thus be shipped safely in open flat cars, on the decks of ships, or in open trailers without danger of rust or corrosion. When ready for use, the steel may be stripped of the coating through the use of any petroleum solvent, such as gasoline. Since the coat dries hard, it makes for easy handling and is not greasy or sticky.

The material is a black liquid which dries rapidly to a hard gloss. Physically, the coating resembles black gloss enamel, although it is not so hard. It may be brushed, dipped or sprayed. Drying time depends on the desired speed and varies from a few minutes in a baking process upward to an hour, if desirable.

The composition of Carbozite is simple—it is 100 per cent Wurtzilite ore, dissolved in any desired vehicle. It weighs 7.5 pounds per gallon, and is tasteless and odorless. Wurtzilite as mined appears not unlike coal and is of the same general texture and weight. To this base and solvent are added other materials such as pigments to provide products with particular characteristics. None of the Carbozite products contains vegetable oils, tar oils or native asphalt substitutes. The vehicle used is derived from a crude base hydrocarbon, and oils being of nondrying character highly resistant to acids and alkalies and containing no saponifiable constituents. Analysis shows the product to be free from inorganic or organic acids.

Extensive tests of the standard Carbozite black have shown its resistance to all acids and alkalies, to heat or cold in a range from below zero to 400 degrees Fahr., and to various atmospheric conditions, including hot acid fumes and moist sea air. Flexibility tests, made by winding a strip of 26-gage steel coated with Carbozite around a ¼-inch mandrel, showed no evidence of cracking or peeling.

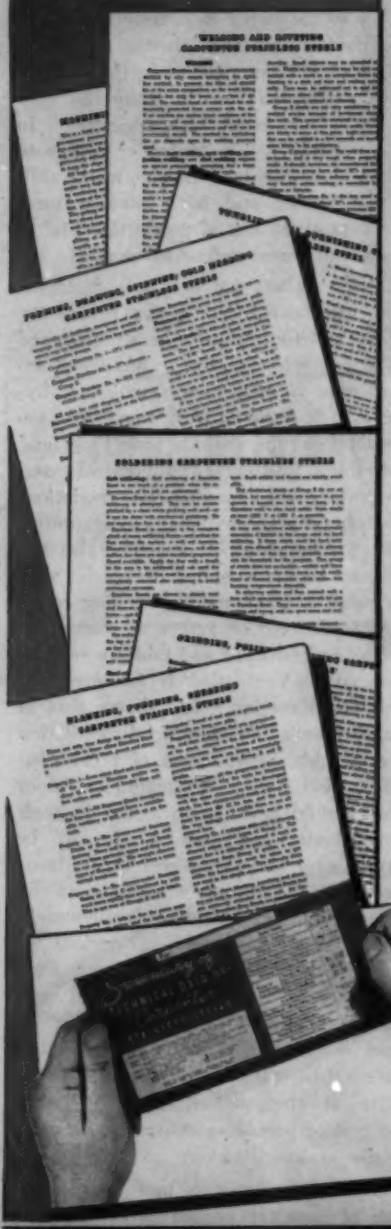
In the production of the material, the ore is given a processing treatment which eliminates all impurities and injurious substances and relines the crude material into a gum. This gum, chemically inert, is the base material of Carbozite products.

In addition to the shop coats, other products include black, red oxide and gray primers for metal, primers for wood and concrete, and top coats of black, red oxide, gray, aluminum and copper. Mastics for application by trowel or brush are also available by varying the solvent. All these coats have the same general properties in that they are odorless and tasteless as well as impervious to water, acid fumes, gases, salt solutions, salt air. They are also dielectric and offer adhesion to all surfaces. When applied hot, they even adhere strongly to moist surfaces.

Carbozite coats are not recommended for applications where heavy abrasion must be resisted. Since the coat remains pliable permanently, continued abrasion will gradually wear it off. It cannot be used where it is subject to contact with oils or oil derivatives since it is soluble in these substances. It is this property which gives it value as a temporary protective coating since it is easily removable by any petroleum solvent.

Corrosion resistant properties of the coatings are shown in this section of pipe, half of which was covered with one coat of black primer and one coat of standard black. The other half was uncoated. Note that after three weeks' exposure to sulphur mine water with high acid content, the coated section appears unaffected, the unprotected portion being eaten completely through

WORKING INFORMATION:



FOR YOUR NEW MEN *who are fabricating Stainless Steel...*

Getting each job done right the first time can save precious hours and days, as well as material that is vital to winning the war.

To help your key men become more familiar with Stainless Steel and various fabricating methods, we offer the Data Sheets described below. These Data Sheets will help to give new workers a better understanding of Stainless Steel fabricating methods. Look over the list below, and check any of the Data Sheets that would be helpful to *your* key men.

Carpenter Stainless Data Sheets

cover the following operations. Each subject is condensed into a single page.

1. Machining
2. Blanking, punching, shearing
3. Grinding, polishing, buffing
4. Forming, drawing, spinning, cold-heading
5. Tumbling, ball burnishing
6. Soldering
7. Welding and riveting

MORE INFORMATION for your key men—and for designers or engineers who are developing new products—is available in this easy-to-use Slide Chart form. The *Stainless Selector Slide Chart* provides information on the analyses best suited for solving various Heat and Corrosion problems. It gives quick answers to questions involving physical properties and fabricating conditions.

A note on your company letterhead will start any of these printed helps on the way to your desk.

The Carpenter Steel Company, 139 Bern St., Reading, Pa.

Carpenter STAINLESS STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

A.R.P. FOR THE FACTORY

American industry, now geared for war production, must be prepared against air raids. Adequate protective measures taken well in advance will do much to lessen the amount of damage from an air raid. As Mr. Baker shows, an efficient A.R.P. system not only protects the plant but enables production to be continued during alerts up to a point where planes are sighted. Here are told how British plants have tackled this problem, providing details of what has been learned by their experience with "blitzes"

By DENYS VAL BAKER
London

ALMOST every large British industrial area has suffered from air raids in the past 18 months. Before the raids began there were many (too many) factories whose managements scoffed at the idea of taking extensive air-raid precautionary measures, avowing that if there were raids full protection would be provided by our air force and anti-aircraft guns. Today there is not a single works in Britain which has not its own A.R.P. personnel, including both first-aid and fire-fighting parties, and its own numerous A.R.P. protections such as shelters, life-saving apparatus, blast-resistant coverings, etc.

We have learned three important lessons from bitter experience: First, that not all the military protection in the world can guarantee complete immunity from bombing; second, that when a factory is caught unprepared, one or two small bombs (even a few incendiaries) may cause untold damage and destruction; third, that when adequate A.R.P. measures *have* been taken, bombing damage can invariably be localized and dealt with so that it has minimum effect. This article explains some of the A.R.P. methods that have been found valuable in Britain so that American industry may be saved some of the unnecessary hardships which we endured over here owing to our ignorance.

There are many aspects of factory A.R.P., but for a general summary these may be classified as follows: Warning system, personnel mobilization, shelter organization, fire-fighting, first-aid, bomb-damage clearance. In addition, of course, there is the very important field of protection against blast and other possible damage. And, finally, all these activities depend upon the formation and training of the necessary A.R.P. groups or squads. The British arrangement, which would probably be equally suitable for America, starts with the Ministry of Home Security, which is responsible for the organization of the country's A.R.P. as a whole—private, public and industrial. One department of this ministry specializes in factory A.R.P. and supplies trained men who are loaned out to plants to help organize an A.R.P. system.

The usual method of collecting personnel is to hold a joint meeting of workers' and employers' representatives at which the trained A.R.P. man gives an outline of what is required and a scheme is settled on, requiring the services of workers to act as part-time wardens, part-time ambulance men, part-time fire-fighters, roof spotters, repair workers, and so on. As far as possible the part-time principle is employed because this is encouraged by the Ministry of Home Security and because it has been found that, generally speaking, workers are keen to do their bit toward protecting what is, after all, their livelihood.

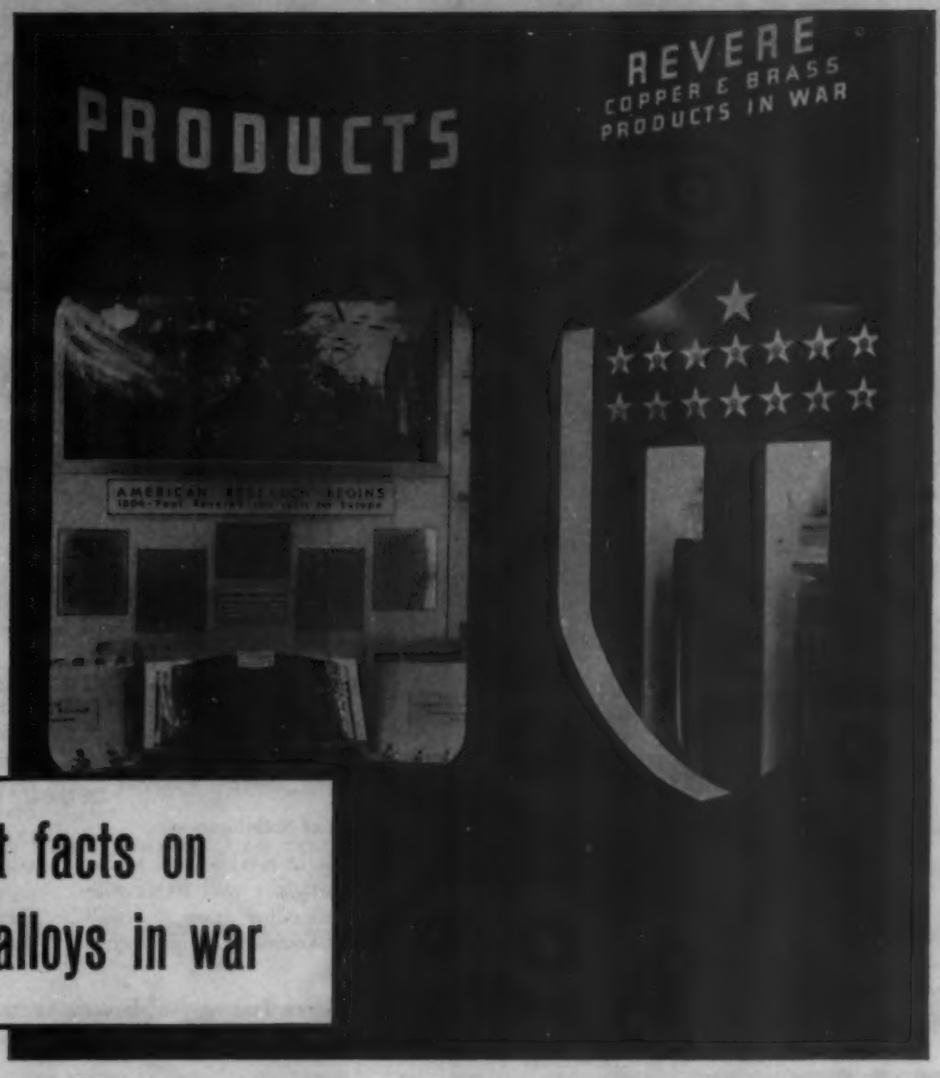
At the same time, most large factories have found it necessary to form a small full-time A.R.P. staff, consisting usually of an A.R.P. controller, a deputy controller, a chief fire-fighter and perhaps a deputy and one or two other men who are responsible for various sections of A.R.P. work. The duties of the controller are quite arduous—in addition to being responsible for ordering equipment, engaging staff, arranging the duty shifts and so on, he has to conduct correspondence and negotiations with the Ministry of Home Security in connection with various A.R.P. orders that are issued, and he has to be in continual contact with both workers and the directors. Consequently there is a big demand for the services of really qualified controllers and their salaries are frequently in the neighborhood of between $1600 and $2000 a year (this for factories with about 3000 or more workers). Most of these controllers are men who have been through special training courses run by the Ministry of Home Security, but many of the correspondence schools are also now arranging courses.

So much for formation of an A.R.P. factory staff. Now to describe something of how they work. Usually the controller has a big central room or office from which he is able to contact all sections of the factory. In the event of a raid or a warning, he takes complete charge and all sections of factory personnel—including directors—have to take orders from him. Under the usual system, every floor, or perhaps every shop or machine-room has its own air-raid warden. He or she is responsible for that section, during raids or alerts, and takes orders from the controller direct. According to the directions received from the controller, the warden either advises workers to carry on with their work or (if raiders are overhead) to file down in orderly fashion to the factory air raid shelter, which is either in the basement or on the ground-floor (in which case it would be specially strengthened with concrete). In this way the A.R.P. controller is able to manipulate the bulk of the works staff as he wishes and in a manner most likely to avoid loss of production and to assure maximum safety to workers.

Deep shelters are best. In factories, they can be reached in the basements. Walls and roofs should be strengthened with concrete or steel. Sufficient regard must be paid to such points as hygiene (it is essential to presume that occupants may be there a long time, and therefore washing arrangements and lavatories and sleeping accomodations must be provided—bunks being preferable for the latter). There is also the catering problem, and it would be wise to install a small mobile cooking range in the shelter, or rather in one part. Chairs and benches and tables would be necessary. Ventilation is an important problem. Experience has shown that in many cases a forced type of ventilation is preferable. Installation of a centrifugal fan and a complete range of air duct work should provide an outlet in each compartment. Extract vents can be formed over and at the rear of the lavatories. With this type of installation the air in all parts of the shelter is adequately changed and no areas or pockets of stagnant air are allowed to form. Furthermore, with a system of forced ventilation, heating elements can easily be fixed in the main duct. The ducting system then will carry the warm air to all parts of the shelter, thus obviating the cost of providing convectors in each of the various divisions.

All that, however, is more in the nature of negative protection of workers, and the more bombing we have experienced, the more we have come to realize that it is one of the least important functions of A.R.P. It is important insofar as it insures protection of the *bulk* of workers and prevents any danger of a panic, but there is far more *constructive*

(*Please turn to Page* 262)



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New developments, concrete examples of improved and new products, technical information, ways of beating schedules, use and availability of products, substitute materials, conversion to war production —all of these will be presented in the way that can help you most.

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If you are unable to come to Cleveland, remember that the Revere Technical Advisory staff is always available to place such information before you, to answer difficult questions, and to work out practical solutions to your copper and copper-alloy problems.

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The Manufacture of

HIGH-QUALITY, LOW-COST STEEL

Heterogeneity of Ingots

By PAUL J. McKIMM
Cleveland

Fig. 7—Molds equipped with early type of hot top

(Concluded from last week)

TESTS of different types of caps on regular rimmed ingots were conducted to determine the chemical and physical difference between ingots capped with cast-iron caps 3 inches thick and with sheet bar crops upon completion of the rimming action. Several heats were made capping half of each with the cast-iron caps and the balance with the bar crops.

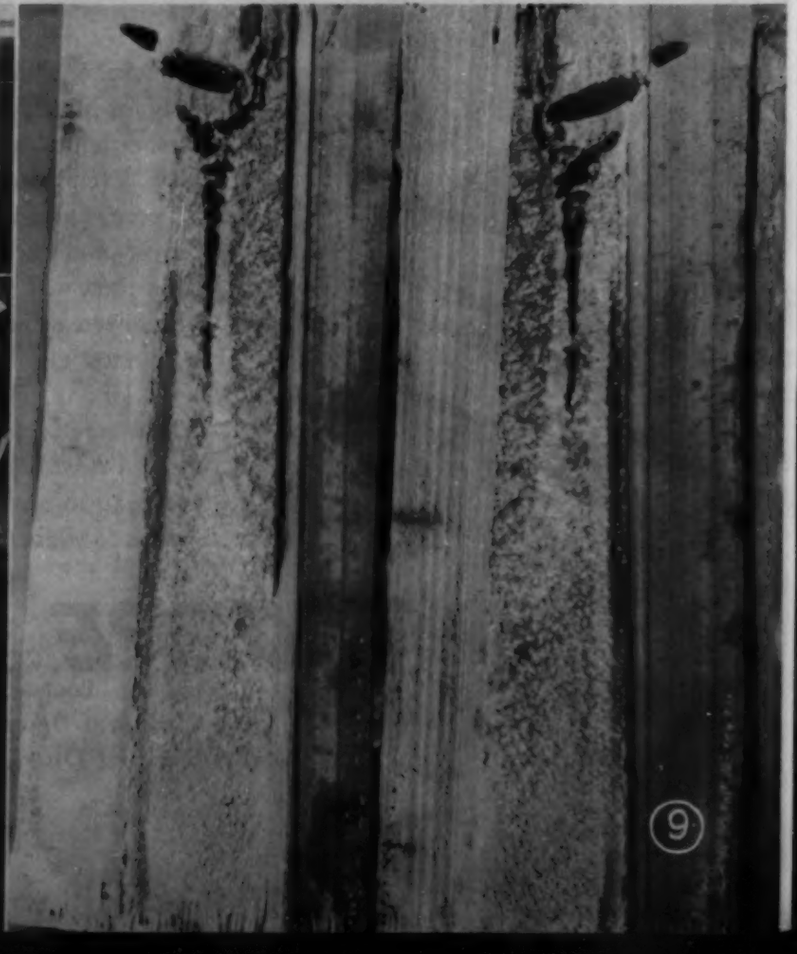
Tests disclosed that ingots capped with heavy cast-iron caps are far inferior to those capped with a lighter or thinner cap from the standpoint of sulphur.

Phases of Solidification

In the system of solidification immediately after casting, a wall forms with chill crystals extending from this wall inward. This is known as primary crystallization. The more impure mother liquor is forced on ahead, while the interior of the ingot is composed of free crystals. This is called secondary solidification.

On solidifying both systems of crystallization behave differently. The chill crystals form a solid, compact mass; these upon cooling contract and eject the more impure molten metal. The

Fig. 8—Split ingots showing the structure of steel that has been poured into normal and insulated molds. Fig. 9—Split ingot of special steel poured without a hot top



A SMALL FURNACE WITH BIG QUESTIONS

- ★ What type of refractory should be used?
- ★ What effect will slag have upon the refractory lining?
- ★ How can the refractory be protected against erosion?
- ★ How can the load-carrying ability of the floor brick be judged?
- ★ What will be the heat losses due to periodic operation?
- ★ What is the best type of arch or roof support for this furnace?
- ★ What precautions should be taken against the effects of expansion and contraction?
- ★ Will heat losses through the structural steel be great? How can they be minimized?
- ★ Should the brick be laid with a heat-setting or an air-setting mortar?
- ★ What type of wall anchoring, if any, is most suitable?
- ★ What protection, if any, should be provided against flame impingement?

B&W Refractories Engineers Answer Questions Like These Every Day.

THE BABCOCK & WILCOX COMPANY
Refractories Division
85 Liberty Street New York, N. Y.

B&W Refractories Engineers are qualified to give advice on furnaces like the one illustrated, or on stress-relieving units that employ as many as 80,000 B&W Insulating Firebrick. Their advice is free and without obligation.

B-137

BABCOCK & WILCOX

Fig. 10—Split ingot of special steel poured with a hot top

Fig. 11—Standard mold in foreground and insulated mold in background

Fig. 12—Split ingot at left was poured under normal procedure; that at the right was jarred during the pouring operation

ejected liquor moves toward the bottom of each individual free crystals, filling the cavities and then moves upward toward the top section of the ingot. There free crystals lie more loosely and the mother liquor forces between them and fills the contracted void areas and spaces as long as it remains fluid or even plastic, which time will be extended with increase impurities.

In order to further investigate factors influencing segregation adjacent ingots were studied, one being insulated and the other not. The insulation, approximately 8 inches thick, was composed of dry foundry sand up to about 10 inches of mold top. The 10 inches were composed of asbestos. After the ingot was poured a cover filled with asbestos was applied. Fig. 11 shows the setup of the two 22 x 24-inch molds, the one in the foreground being a standard mold and the one in the background an insulated mold.

Details of Heat

The heat herewith represented had a ladle analysis of carbon 0.08, manganese 0.32, phosphorus 0.010, sulphur 0.028 and copper 0.13 per cent. Pouring time per ingot was 35 seconds. Time from the finish of the pour until the removal of the insulation was 21 hours and the time from the finish of the pour until stripping the mold was 25 hours.

The regular ingot conformed to good rimming practice while the insulated ingot rimmed poorly and grew considerable. Fig. 8 shows the two types of ingots after splitting to within 8 inches of the axial area and then fractured. It will be noted by the indentations along the surface of the insulated ingot that a greater number of blows were required by the "drop" for fracturing because of the porous structure.

The regular ingot had a carbon variation of 0.04 to 0.07 per cent and sulphur of 0.017 to 0.036 per cent. The insulated ingot had a variation in carbon of 0.04 to 0.09 per cent. The sulphur varied from 0.018 to 0.068 per cent which is considerably in excess of that found in the normal ingot.

It appears impractical to produce ingots by general insulation. The mold expands excessively and thus permits the molten metal to break through at numerous places (bleeders) yielding a surface that has to be chipped or scarfed excessively. The steel is far too porous and excessive croppage is required. Segregation is far too excessive to secure the desired quality for special drawing quality sheets and hot and cold rolled strip.

Mold Casings Were Tried

A plan suggested a few years ago and said to have a beneficial influence on improving segregation and promoting greater soundness in rimmed ingots involved placing casings in the mold. Two methods were followed. The first method was to equip half or 12 molds with casings made of 12-gage 18 x 76-inch sheets and weighing 342 pounds per ingot. These strips were pickled to prevent any reaction with the molten steel and spaced equally apart, except for allowing a 4-inch space in the center for teeming. Segregation tests showed little difference in the physical characteristics of ingots poured with or without casings.

Another method employed four nested steel boxes of pickled scrap. These were approximately 5, 9, 13 and 17 inches square and extended the full length of the mold with openings at the bottom for the flow of metal as usual. This arrangement afforded no improvement in segregation, density, soundness nor wall thickness, and therefore had no value.

A method of producing sound ingots is that of jarring or shaking the molds while the ingot is being poured and thereafter while the metal is still in a molten condition. Some plants using the steam locomotive shook several buggies during the pouring operation; others had a system of an up-and-down motion by using a crane.

Obviously it is desirable to obtain sound ingots substantially free from slag inclusions, gas cavities, etc., and without great initial expenditures for equipment changes irrespective of whether ingots are cast on buggies or in a pouring pit with or without the use of hot-tops. As it is not convenient nor practical to anchor molds to the stools the jarring necessary to produce the desired ingot characteristics must be of such

(*Please turn to Page* 277)

"TRIAL-TEST" POR-OS-WAY

the new, precision grinding wheel!

IT DELIVERS

2 TO 5 TIMES MORE PRODUCTION PER MAN PER MACHINE

LET USERS TELL THE STORY—

STER AND COOLER—"Cut so much ster and cooler than other wheels that veral department heads were called in witness the operation." (Surface inding small discs.)

0% BETTER PRODUCTION—"Gave 0% better production than competitor eel. Held a true edge in grinding a mplete gear cutter with no burn whatever. Free, cool cutting without dressg. Good finish." (Grinding high-speed tter tool steel on Le Blond grinder at 50 R.P.M.)

CH EXCELLENT RESULTS—"As head department, would like to change over grinding to Por-os-way wheels as I ve had such excellent results."

0% BETTER PRODUCTION—"Very ccessful; gave 350% better production." rinding Stellite "J" cutter heads on cinnati No. 2 tool and cutter grind- at 5735 R.P.M.)

OUTSTANDING GRINDING QUALITIES—"Outstanding grinding qualities. Wheel wore but ¼" on 50 pcs. ground. Edge held up." (Grinding shafts in gauges at 3200 R.P.M., removing .005" stock.)

NO LOADING, NO BURN—"Cut freely, did not load and cut hardest steel without any trace of burn. Obtained at least 300% better production." (Facing tool steel gears SAE 41-50 at 3460 R.P.M.)

HELD EDGE WITHOUT DRESSING—"Gave 50% better production than competitor. Held edge without dressing. Ground 4942 pcs.—average 353 pcs. per hour." (Grinding hardened steel bushings on B & S.)

25% INCREASE IN WHEEL LIFE—"Enclosed find order for Por-os-way. Trials very satisfactory. Reduction of 40% grinding time. 25% increase in wheel life".

POR-OS-WAY* 8 WAYS BETTER

1. 2 to 5 times faster stock removal. Takes deeper cuts, or usual cuts at faster feeds.
2. Holds its corners. Requires only minimum dressing.
3. Does its job at the lowest possible cost.
4. Equal or better wheel life.
5. Cool action structure.
6. Practically ends burning.
7. One man, one machine can do the work of 2 to 5.
8. Free cutting. Resists "loading" of soft materials.

See the trend to Por-os-way—introduced formally in Fortune Magazine, February, 1942.

*T. M. Reg. U. S. Pat. Off.
©1942 A. P. DeSanno & Son, Inc.

SUGGESTION:

Mail the coupon yourself or clip ad, check below and route to responsible person.

Superintendent .....
Works Manager .....
Master Mechanic .....
Grinder Foreman ....
Mr. .....
Mr. .....

A. P. DE SANNO & SON, INC.
436 Wheatland St.
Phoenixville, Pennsylvania

CERTAINLY— I WANT 2 TO 5 TIMES MORE PRODUCTION PER MAN PER MACHINE. Send along that Por-os-way folder with its "Prescription Blank" for a demonstration of Por-os-way's 8 advantages.

NAME _____
TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____

A. P. DE SANNO & SON, INC.
NEW YORK, CHICAGO, PITTSBURGH, CLEVELAND, DETROIT, LOS ANGELES

PHOENIXVILLE, PENNA.
The Western Gateway to Valley Forge

More Tons Per Trip.

Many war plants are getting more work from their battery lift trucks by using them as tractors. Each carries one skid load and at the same time pull one or more additional skid loads on trailers. They pick up the loads and put them on the trailers, then set them off at the destination and spot them wherever wanted. The same method can be applied to fork trucks and pallet loads, and is useful for relatively long hauls. It yields more tons per trip and, because of the relatively small dead weight of the trailers, also results in more tons per kw-hr.

Waiting Is Not Working.

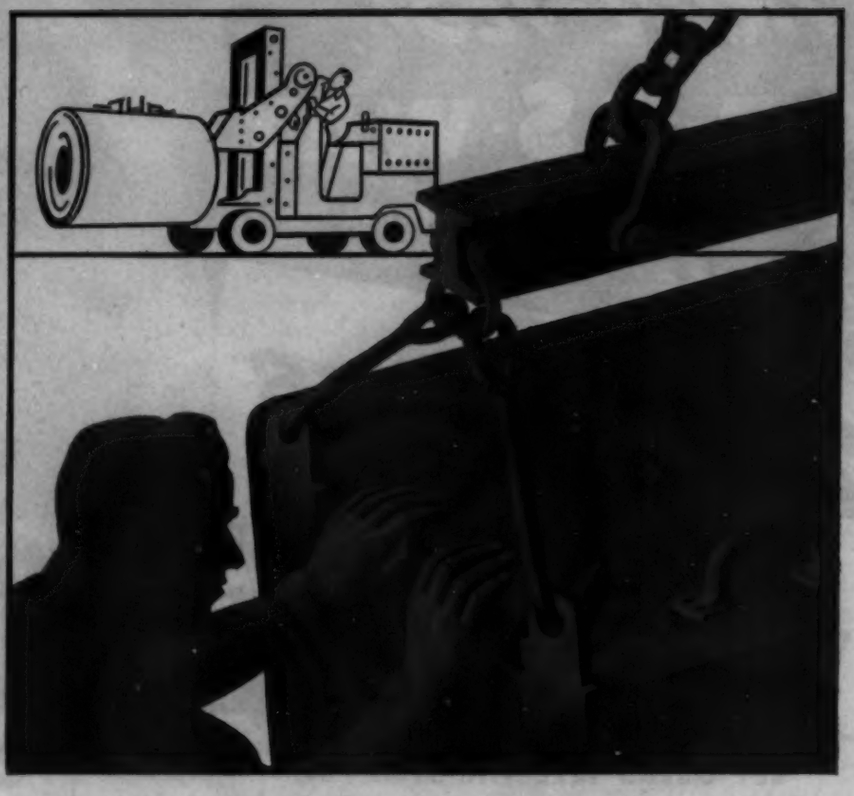
Highway trucks handling interplant shipments spend more time on the road and less time waiting at the loading docks when goods are shipped on skids or pallets or, if boxed, are provided with battens underneath. Then battery fork trucks can be used to stow the loads, and they can do it in a mere fraction of the time it takes to do the job by hand, thus conserving precious man-hours as well as truck hours. Both savings are doubled when the consignee uses the same method to unload.

Dependability Is Twins.

The fact that an alkaline battery as the power unit of a material-handling truck almost never has to be pulled off the job for repairs saves two ways: First, it avoids delays on the job itself—which makes it a real ally of the production superintendent. Second, it conserves the time of maintenance men by permitting their full time on maintenance rather than repairs. This is what we mean when we say that the Edison Battery's performance is predictable: the slight care it needs can be regularly scheduled.

Edison Storage Battery Division
Thomas A. Edison, Inc.
WEST ORANGE, N. J.

THIS POWER is predictable



America depends upon you to deliver—just as you depend upon your battery industrial trucks to expedite material-handling without congestion, bottlenecks or delay. Your production and the power unit in your industrial trucks are inseparably linked. When alkaline batteries power your trucks you *know* their performance is predictable because you *know* the batteries are designed that way. They are so rugged structurally and so foolproof electrically that they are your guarantee of an uninterrupted flow of production. Therefore, they help you get more from your present material-handling equipment, you save precious man-hours—and above all they help insure your ability to produce from the minute materials enter your plant until the finished product leaves it.

Throughout industry, in mines and on railroads, the predictable qualities of Edison Alkaline Batteries are paying big rewards. Yes—

INDUSTRY NEEDS THE RELIABILITY OF

Edison Alkaline BATTERIES

Fig. 1. (Left)—Checking condition of brushes, brush holders and commutator. Carbon brushes should move freely in brush holders. Also spring tension in brush is checked and adjusted if necessary. Too much tension will cause unnecessary wear; too little causes poor commutation

Fig. 2. (Right)—Wear in armature bearings is checked by placing lever between teeth of gear and under motor pinion. By raising lever, wear in this bearing is easily detected. Bearing at pinion end of motor invariably wears faster

REGULAR CRANE INSPECTION

reduces maintenance—avoids breakdowns—assures safety

By TOM MARNEY
Crane Inspector
Factory Service Division
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

IN A LARGE manufacturing plant like the Westinghouse Electric & Mfg. Co., at East Pittsburgh, Pa., where there are about 260 overhead electric cranes and some 420 electric hoists, the crane inspection department is an important unit.

While the primary duty of the inspector is safety, the reporting and prompt repairing of defective equipment, which would not affect the safety of workmen on the floor, sometimes avoids major repairs and reduces maintenance costs. Since a minor defect takes only a fraction of the time to repair if repaired promptly, a more continuous crane service is assured. This is an important factor in the war effort.

The duties of the crane inspector can be defined as follows: Inspect electric travelling cranes, electric hoists, crane runways, trolley wires, load cables and chains attached to cranes; give full reports at regular intervals on these inspections, and keep reports on file for reference of the state department of labor and industry; authorize corrections to be made, check repairs when made; and inspect all new crane installations or major repair jobs.

Since it is imperative that the cranes be inspected at regular intervals without too much time elapsing between inspections, a system of procedure is followed. Each part is inspected in its proper order as shown on the crane inspector's report. When the inspection is completed, any defects are noted down in the same order, later to be written on however, is telephoned to the factory the official report. Any serious defect, service department. If conditions warrant, a defective apparatus tag is attached to the crane by the inspector. This tag may only be removed by the inspector after repairs have been completed to his satisfaction. The routine of crane inspection is as follows:

—Inspect cage for security.

—Check and try control.

—Examine hoist cable or chain.

—Inspect bridge motors, bearings, gears, track wheels, lubrication, etc.

—Check hoist motors, bearings, gears, limit switches, guards and brakes.

—Check trolley motors, bearings, gears, wheels, guards and open wires.

—Main trolley wires.

Crane Inspection Routine: Suppose we make a mythical inspection of a 15-ton crane with control in one of our large manufacturing aisles, note down the defects and diagnose their causes.

In entering the crane, the cage is inspected for security. At all times throughout the examination the inspector must be on the lookout for loose bolts, cracked castings or wheel spokes, and the like. Tapping with a small hammer which is part of the inspector's equipment will determine their condition. The master switches, control panel and resistors are next checked. With the exception of a few dirty and slightly burned contacts on the panels everything appears to be normal.

The switch is now closed and the crane operated with the power on. In

(*Please turn to Page* 282)

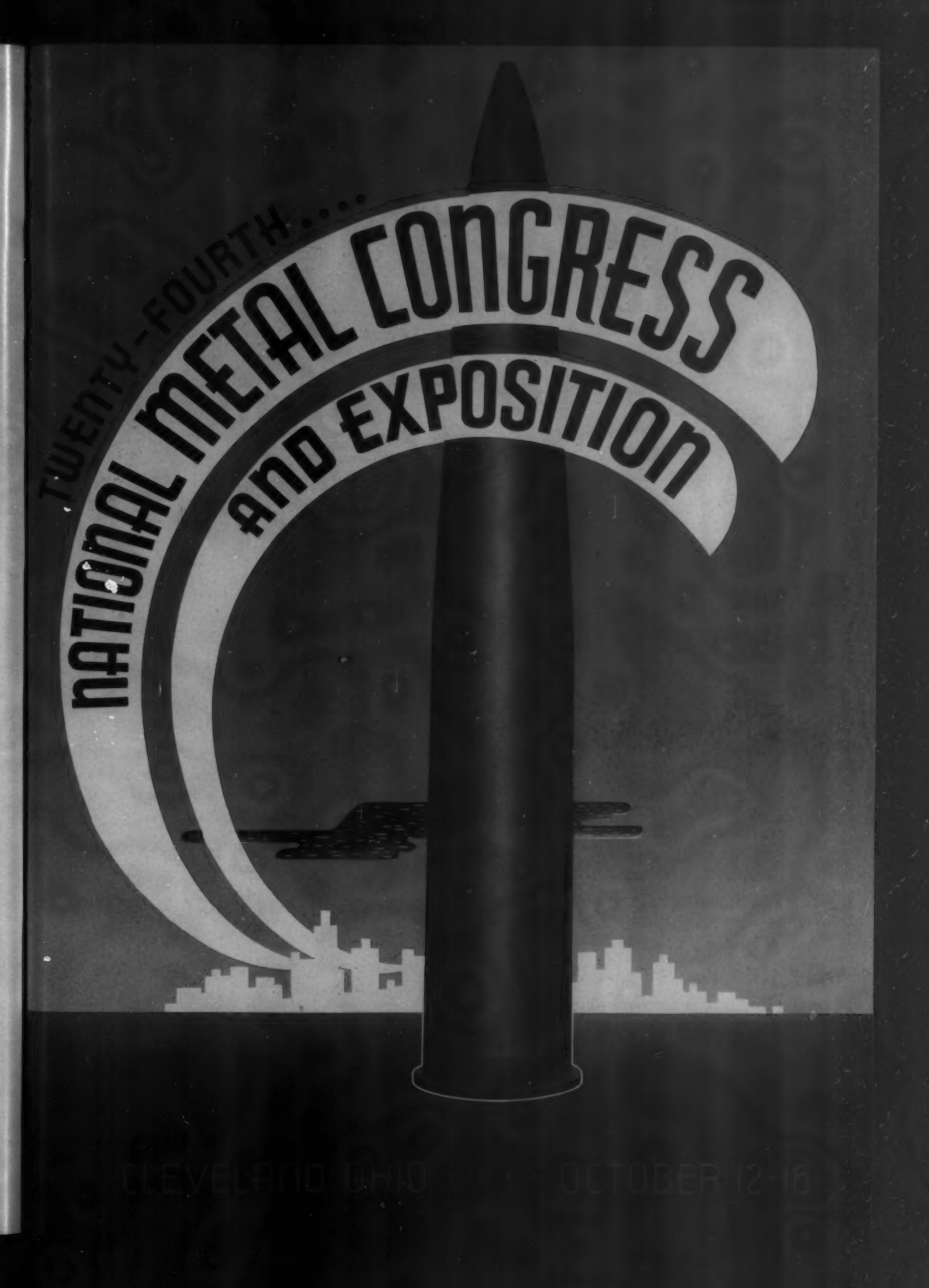
MEMORABLE WORDS OF GREAT AMERICANS

William McKinley

"LET US EVER REMEMBER THAT OUR INTEREST IS IN CONCORD, NOT IN CONFLICT, AND THAT OUR REAL EMINENCE RESTS IN THE VICTORIES OF PEACE, NOT THOSE OF WAR."

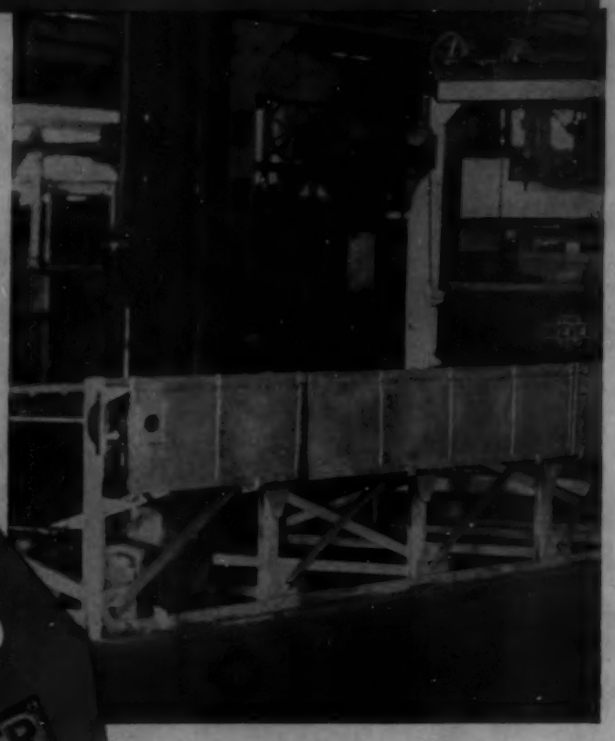
William McKinley, twenty-fifth President of the United States was representative of the better characteristics of Americanism. The above quotation was part of a speech he delivered the day of his assassination, September 6th, 1901.

THERMALLOY the "EYE" of QUALITY
THE ELECTRO ALLOYS COMPANY
CASTINGS FOR HEAT CORROSION
ELYRIA, OHIO
QUALITY CASTINGS SINCE 1918


TWENTY-FOURTH....
NATIONAL METAL CONGRESS
AND EXPOSITION

DREVER CONTINUOUS

A Drever Continuous Furnace Line is the modern means of carrying materials through successive heat treating operations with minimum manual handling and consequent minimum time loss between operations.



Material movement from one unit to the next in line is controlled from central pulpits, with all phases of treatment under convenient control by the operators.

Some of the advantages of this straight line production equipment are listed below.

1. HIGH PRODUCTION RATE:

(a) Material handling between related units is mechanical, insuring minimum time loss between operations.

(b) Individual units in the line are designed for the material to be heated and are conservatively rated.

2. LOW OPERATING COST:

(a) Continuous mechanical movement of materials eliminates intermediate handling crews.

(b) Centralized operating control makes it unnecessary to have operators and helpers for individual units.

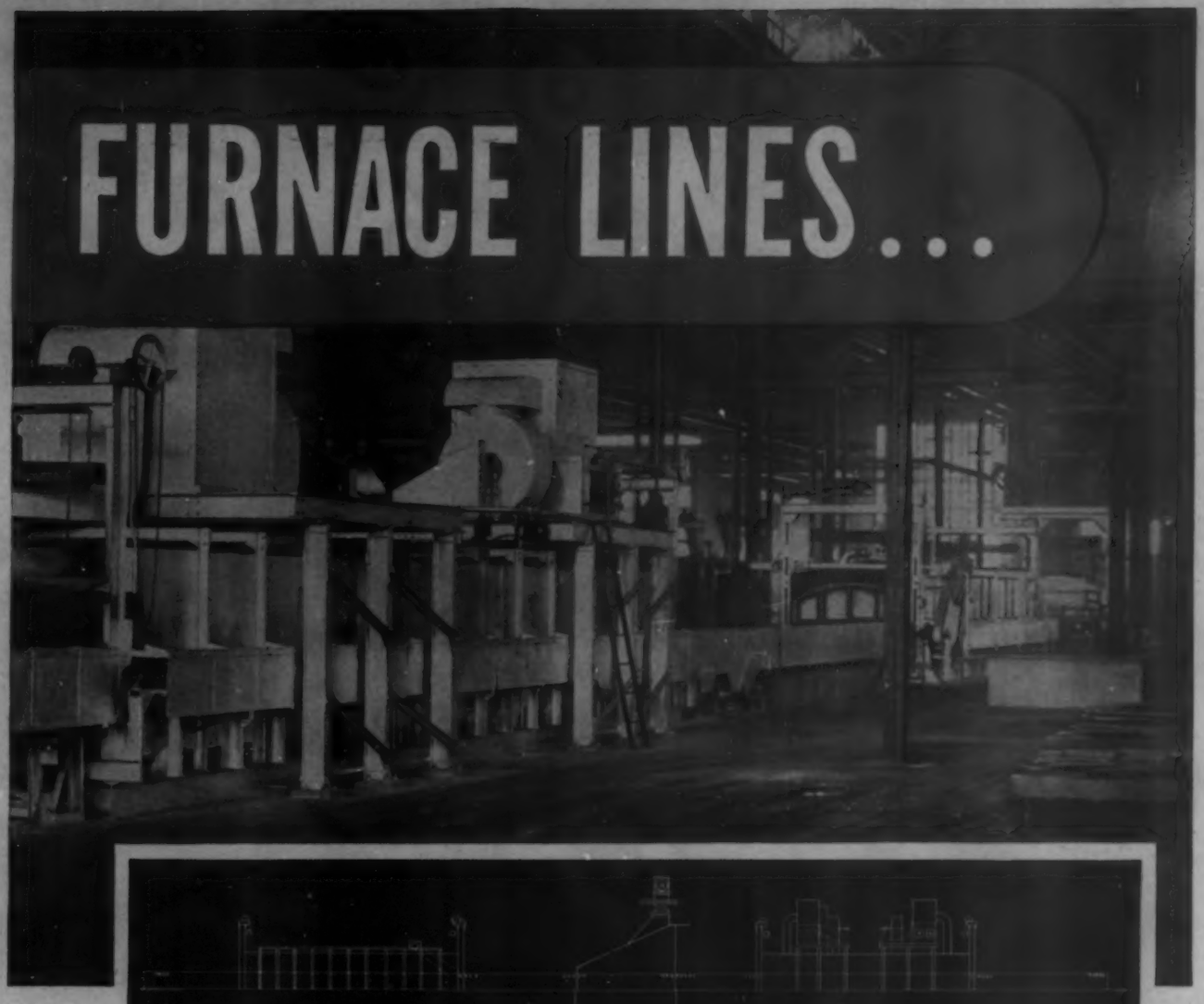
(c) Production rates are consistently high.

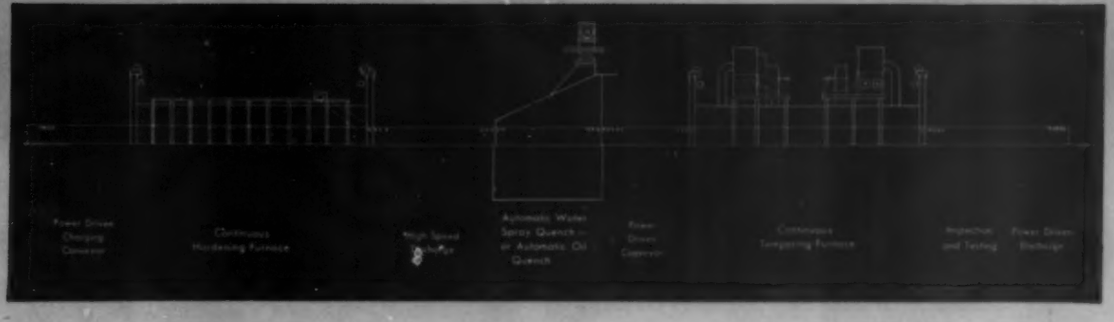
3. UNIFORMLY HIGH QUALITY OF TREATED MATERIAL:

(a) Each piece of material is subjected to the same treatment.

(b) The human element is reduced to a minimum.

FURNACE LINES...





(Inspection and checking can be a part of the continuous production line.)

4. MAXIMUM PRODUCTION PER SQUARE FOOT OF SPACE:

(a) The need for storage and manual transfer areas between successive operations is eliminated.

5. ADAPTABILITY:

(a) Proper choice of conveying means and correct relation of units permit handling of a wide variety of parts and materials.

The design shown is a Roller Hearth type for heat treating plate. Capacity can be made to suit requirements.

THE DREVER CO.
730 E. VENANGO ST.
PHILADELPHIA, PA.

TITANIUM ALLOYS AVAILABLE

TAM
(F. C. T.) FERRO-CARBON-TITANIUM
FOR DEOXIDATION

TAM
40% FERRO-TITANIUM
FOR STAINLESS STEEL

TAM
FOUNDRY FERRO-TITANIUM
FOR IRON AND STEEL

There is *no* scarcity of TAM Titanium Alloys for the Iron and Steel Industries or TAM Zirconite Sand, Flour and Mold and Core Washes.

Our expanded manufacturing facilities enable us to fill orders for all requirements.

Find out about these TAM products. Visit the TAMCO exhibit in Booth A-336 at the National Metals Exposition October 12 to 16 in Cleveland. TAM's staff of experienced field engineers will gladly explain how you can benefit with TAM Titanium Alloys and Zirconite products.

REMEMBER to get the facts on TAM products at the National Metals Exposition October 12 to 16... Cleveland... Booth A-336

TITANIUM ALLOY MANUFACTURING CO.
GENERAL OFFICES AND WORKS: NIAGARA FALLS, N. Y., U. S. A.
EXECUTIVE OFFICES: 111 BROADWAY, NEW YORK CITY

TAM ZIRCONITE PRODUCTS AVAILABLE

TAM

Foundry Zirconite Sand (in three grades)

Melting Points from 3650° F to 3950° F

TAM

Foundry Zirconite Flour (in two grades)

Melting Points from 3650° F to 3812° F

TAM

Foundry Zirconite Mold and Core Washes (in three grades)

Super-refractory compounds with melting points from 3600° F to 3775° F

(ZIRCONITE PRODUCTS SHIPPED TO CANADA DUTY FREE)

Representatives for the Pacific Coast . . . . Balfour, Guthrie & Co., San Francisco, Los Angeles, Portland, Seattle, Tacoma

Representatives for Canada . . Railway & Power Eng. Corp., Ltd., Toronto, Montreal, Hamilton, Winnipeg, Vancouver, Sydney

Representatives for Europe . . . . . T. Rowlands & Co., Ltd., 23-27 Broomhall St., Sheffield, England

Forging—

National Forging Machines
are doing
"Their Part"
by using
LESS STEEL
to make shells, bombs, airplane cylinders and limitless forgings for our armed forces.

THE NATIONAL MACHINERY C

New York Detroit

for Victory

National Maxipresses
are equally effective
for forging aluminum pistons, supercharger impellers, steel cartridge cases and numerous armament jobs.

To produce with *LESS* is a *MUST* today.

COMPANY, TIFFIN, OHIO, U.S.A.

Chicago

"GET IN YOUR SCRAP—

WE'LL PRODUCE THE FIGHTING STEELS!"

. . . this headline statement is a challenge that comes to you from the thousands of steel workers throughout America. Like the men in your own plant, these steel men are doing their fighting by producing war materials in greater volume than ever before, and they are doing it largely with existing furnaces and machines. Men in steel are determined to hold *their* production records, and even to better them, so that your workers may have the steel they need.

To do this requires scrap and more scrap, and the steel workers look to you to help yourself by helping them get the scrap.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

PARTNER TO INDUSTRY IN WAR PRODUCTION

J&L STEEL

SERVING AMERICA'S WAR INDUSTRIES

Southwark

for

HYDRAULIC PRESSES
and
SPECIAL MACHINERY

Baldwin Southwark

DIVISION OF
THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA

BLW
THE BALDWIN GROUP

READY REFERENCE DATA

FOR YOUR HELP IN FABRICATING SEYMOUR PHOSPHOR BRONZE--

SEYMOUR PHOSPHOR BRONZE

ALLOY	Alloy No.	COMPOSITION Approximate Percent				Tensile Strength lbs. per sq. in.		Elongation Percent in 2 in. min.	
		Copper	Zinc	Tin	Lead	Hard to Spring	Soft	Hard to Spring	Soft
GRADE A (Sheet)*	950	95.00		5.00		105,000	45,000	1.5	50
" B (Rod)*	494	94.00		5.00	1.00	61,000	50,000		40
" C (Sheet)*	928	92.00		8.00		112,000	55,000	3	
" D (")*	910	90.00		10.00		115,000	60,000	5	65
PHOSPH. BRONZE (Rod)*	444	88.00	4.00	4.00	4.00	*60,000 (Small Size Only)		20	

*Contain Phosphorus

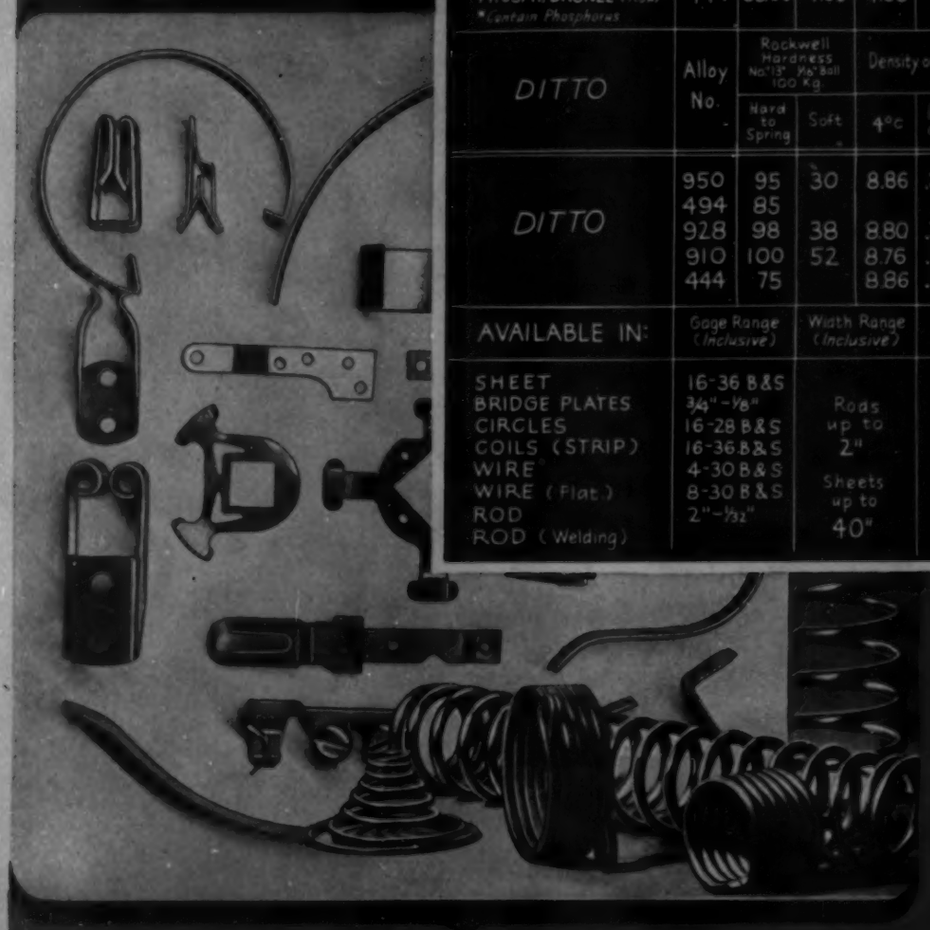
DITTO	Alloy No.	Rockwell Hardness No. 1/16" Ball 100 Kg		Density or Spec. Grav.			Melting Point °F	Elec. Resistance	Elec. Conductivity % I.A.C.S. 20°C
		Hard to Spring	Soft	4°C	lbs. per cu. in.	lbs. per cu. ft.			
DITTO	950	95	30	8.86	.320	552	1920	6.1	16.5
	494	85						6.0	16.8
	928	98	38	8.80	.318	549		7.8	12.8
	910	100	52	8.76	.316	546		9.4	10.6
	444	75		8.86	.320	552	1830	8.2	12.2

AVAILABLE IN:	Gage Range (Inclusive)	Width Range (Inclusive)
SHEET	16-36 B&S	Rods up to 2"
BRIDGE PLATES	3/4"-1/8"	
CIRCLES	16-28 B&S	
COILS (STRIP)	16-36 B&S	
WIRE	4-30 B&S	Sheets up to 40"
WIRE (Flat.)	8-30 B&S	
ROD	2"-1/32"	
ROD (Welding)		

MISCELLANEOUS

WIRE AND ROD supplied Round, Half-Round, Quarter-Round, Oval, Half-Oval, Hexagon, Octagon, Square, Triangular or Fancy-tinned or bare.

SHEET AND STRIP in roll finish or Patent Level. Strip tinned if desired.



THE SEYMOUR MFG. CO. SEYMOUR, CONN.

NON-FERROUS ALLOYS SINCE 1878

SEYMOUR

PHOSPHOR BRONZE

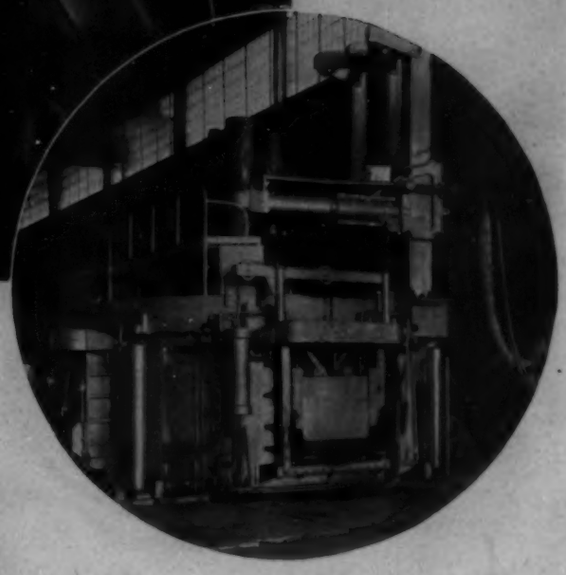
. . . SPEED WORK IN SHIPYARDS AND INDUSTRIAL YARDS ON DOCKS AND IN PORTS

Operated by one man and powered by one engine, they conserve vital time, fuel and material. They move about fast on pneumatic tired wheels without damage to roadways.

Available in a wide range of sizes for jobs with high priority, these fine new Cranes are helping to win the War. Descriptive literature available on request.

THE OSGOOD CO.
MARION, OHIO
MOBILCRANES

THE GENERAL EXCAVATOR CO.
MARION, OHIO
SUPERCRANES



(Above) Tapping a 50 ton top charge Lectromelt furnace.
(Right) The same furnace in normal operating position.

Speeding Up... Steel Production

With the largest TOP CHARGE electric furnace

★ The fine performance and reliability of Lectromelt furnaces are contributing in a vital manner to the increased tempo of the armament program.

Pictured above is the largest top charge electric furnace in the United States. This is one of the 17′ diameter, size KT-50 ton capacity Lectromelts now on alloy steel production. Similar capacity furnaces are turning out heats of 50 tons of plain carbon steel. The top charge type Lectromelt furnaces increase steel production, and their use results in savings in power, electrodes, refractories and man hours.

MOORE RAPID *Lectromelt* FURNACES

Lectromelts are built in standard sizes from 100 tons down to 25 pounds capacity. Both top charge and door charge types are available, and detailed information will be gladly furnished on request.

PITTSBURGH LECTROMELT FURNACE CORPORATION

Pittsburgh, Pennsylvania

RUGGED AND FAST!

★

THE FAMOUS
MAXIMILLER
for PRODUCTION NOW!

★

OUTSTANDING
IN THE 54-YEAR
HISTORY OF
KEMPSMITH
MILLING MACHINES

KEMPSMITH MAXIMILLER

For PRODUCTION *Now* AND IN THE FUTURE —

MAXIMILLERS have what it takes for the grim battle of PRODUCTION NOW in our VICTORY OFFENSIVE . . . because MAXIMILLERS have that surplus of sturdiness needed for heavier cuts (free from dangerous deflection or vibration); increased range of speeds and feeds; more power; longer accuracy; compact design; centralized control; and many other KEMPSMITH advantages. Sizes No. 2, 3, 4 & 5 . . . Vertical and Horizontal (Plain or Universal).

BUILT TO SPEED PRODUCTION ECONOMICALLY ON "3-SHIFT" SCHEDULES

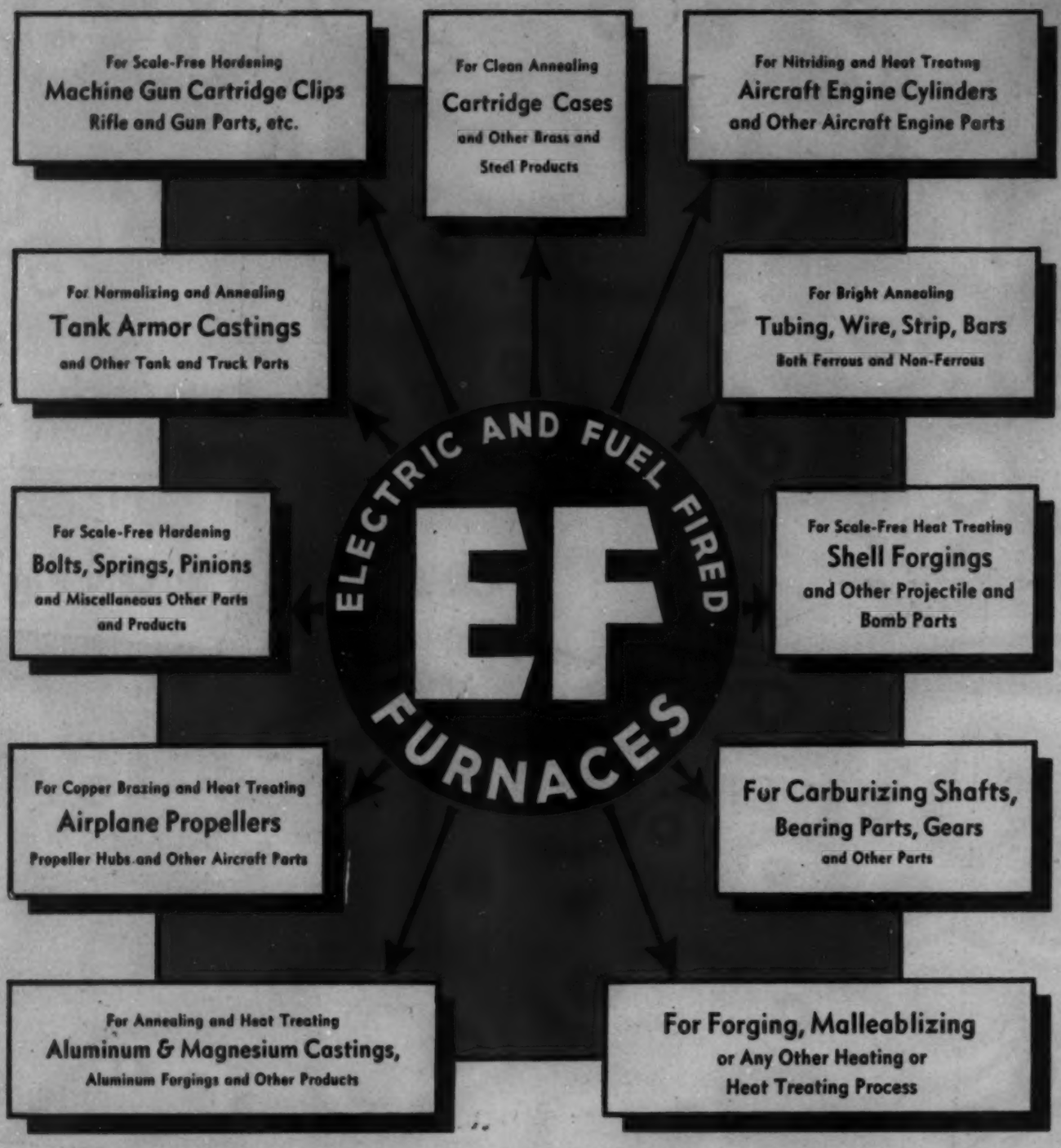
PRECISION

MILLING MACHINERY

Experience SINCE 1888

KEMPSMITH MACHINE CO.

MILWAUKEE • WISCONSIN



Increased production and uniformity; the saving of valuable time, labor and metals and other advantages have been effected by recent EF continuous automatic, semi-continuous and batch type furnace installations.

The Electric Furnace Co. specializes in designing and building production furnaces and time and labor saving material handling equipment. Years of practical furnace building experience have enabled EF engineers to develop some outstanding production furnaces for handling the above materials and many other essential war products.

Submit *your* production furnace problems to EF engineers. Phone 4661, Salem, Ohio.

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces---For Any Process, Product or Production

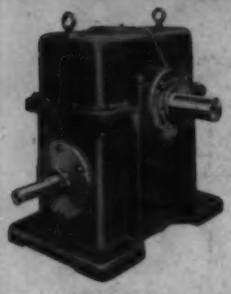
To help you SPEED PRODUCTION

HERRINGBONE REDUCERS

Available in single, double and triple reduction types in a wide range of ratios and ratings.

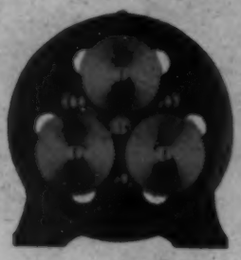
WORM-HELICAL SPEED REDUCERS

A versatile line of double reduction units for agitators, mixers or other applications requiring a vertical shaft drive.



WORM GEAR REDUCERS

Built in light and heavy duty types and in various styles to suit the conditions.



SPUR GEAR REDUCERS

Concentric straight line drive in single and double reduction units.

CUT AND MOLDED TOOTH GEARS

Jones gear cutting practice represents the accumulated technical knowledge of 50 years backed by the finest gear cutting equipment and craftsmanship. The line covers cut tooth spur, helical, herringbone, worm, bevel, and mitre gears of high test cast iron, steel, bronze, or non-metallic material. An extensive line of patterns is also available for high test cast iron molded tooth, spur, bevel and mitre gears.

CAR PULLERS

These car pullers are built by Jones as complete units with motor included if desired, or with base to take purchaser's motor. The cable drum is driven by a Jones double or triple reduction Herringbone speed reducer and the control station may be located at a point to give the operator a clear view of the tracks and spotting positions.

DOOR HOISTS

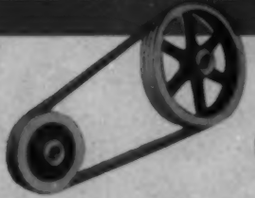
The Jones Door Hoist is a simple, compact and sturdy heavy duty worm gear driven unit that has been widely used in the steel industry for handling furnace doors. It is also applicable to other services where doors of various types must be opened and closed and where it is desired to avoid the complications of limit switches.

SKIP HOIST DRIVES

Jones Skip Hoist Drives are equipped with all the modern protective devices such as cam or nut type limit switches, solenoid or disc type brakes and slack cable switches. Drives are standard Jones Herringbone Speed Reducers.

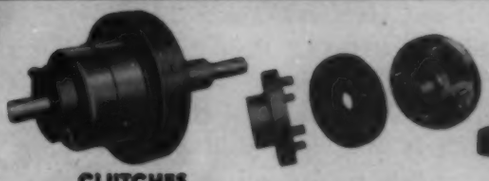
PULLEYS

Jones pulleys are machine molded, poured of high test cast iron, and are accurately finished and balanced. Single arm, double arm, multiple piece and extra heavy conveyor pulleys and flywheels can be supplied.



V-BELT SHEAVES

Made of high test cast iron. Sheaves for "AB" light duty combination and "C" belts in stock with keyseated bushings. Standard and special sheaves for all industrial belt sections made to order.



CLUTCHES

Built for a broad range of shaft sizes and ratings in both enclosed and open types for sleeve and coupling work. In addition they are available in a line of friction clutch pulleys. This clutch modification is also used with gears, V-belt sheaves or sprocket wheels.

COUPLINGS

High and low speed flexible couplings, flange, keyless compression, ribbed and jaw clutch couplings.

PILLOW BLOCKS

Jones Pillow Blocks have double row Timken Roller Bearings locked firmly to the shaft by means of a tapered split steel adaptor and clamp nut. Effective seal retains lubricant . . . easily removed from shaft.

HANGERS

Jones drop hangers, post hangers and bracket hangers are strongly reinforced with arch bracing. Free universal adjustment. Feet are ground.

W. A. JONES FOUNDRY & MACHINE COMPANY

4437 Roosevelt Road, Chicago, Illinois

Jones

BULLETIN No. 80

"Jones Drives for Industry" may be helpful in giving you a complete picture of the Jones products, engineering services and manufacturing facilities that are available. Your request will bring a copy.

THE BROOKLYN BRIDGE, *completed in 1879,—the beams and channels of the superstructure were made at Midvale*

Visitors thronged the city at the opening. President Arthur and Governor Cleveland came. "Brooklyn," said the *Tribune*, "blossomed like a rose." Probably no other single event was more instrumental in making New York what it is today—first city of the world. An interesting thing about those Midvale beams and channels is that their rolling, direct from billets of rectangular cross section, was wholly new. Midvale's attitude then, as today, was that new problems demanded new approaches—safeguarded by seasoned experience.

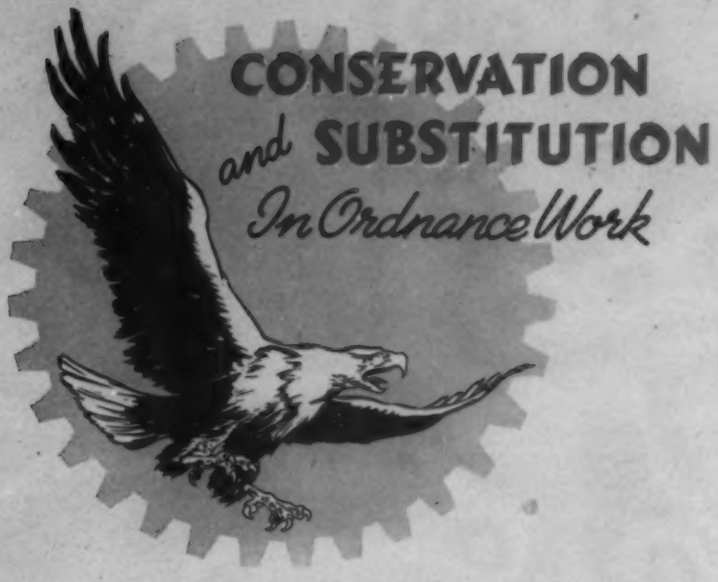
1867 75TH ANNIVERSARY 1942

THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA, PA.

OFFICES: New York • Chicago • Pittsburgh • Washington • Cleveland • San Francisco

MIDVALE

National Metal Congress and Exposition to aid



Today's No. 1 Problem

For two years our war industries have been expanding at a tremendous rate till today there is real danger of material shortages hampering their capacity operation. Yet our need for war goods continues to increase.

From the materials standpoint, we are in many ways in a much worse condition than the Axis, particularly Germany, inasmuch as we have lost vast quantities of war materiel by capture. Too, we cannot so readily recover scrap such as cartridge cases due to our long transport lines extending to all parts of the world.

At the same time, our need for war goods climbs a steep spiral, for we must be prepared to meet the threat of attack at whatever point it may be delivered. Then to mass an effective supply of arms for any offensive action requires yet more military equipment.

WE CANNOT AFFORD TO LET MATERIAL SHORTAGES CUT WAR PRODUCTION.

Here and in succeeding issues, STEEL's editors describe some of the moves being made by the United States Army Ordnance Department in co-operation with American industry on the complicated chequer-board of materials supplies, in the interests of conservation. They directly supplement the production shortcuts scheduled for a series of meetings on Ordnance Production featuring the 1942 National Metal Congress and Exposition. See p. 209.

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War Destruction...

spotlights need for conservation and substitution of critical raw materials

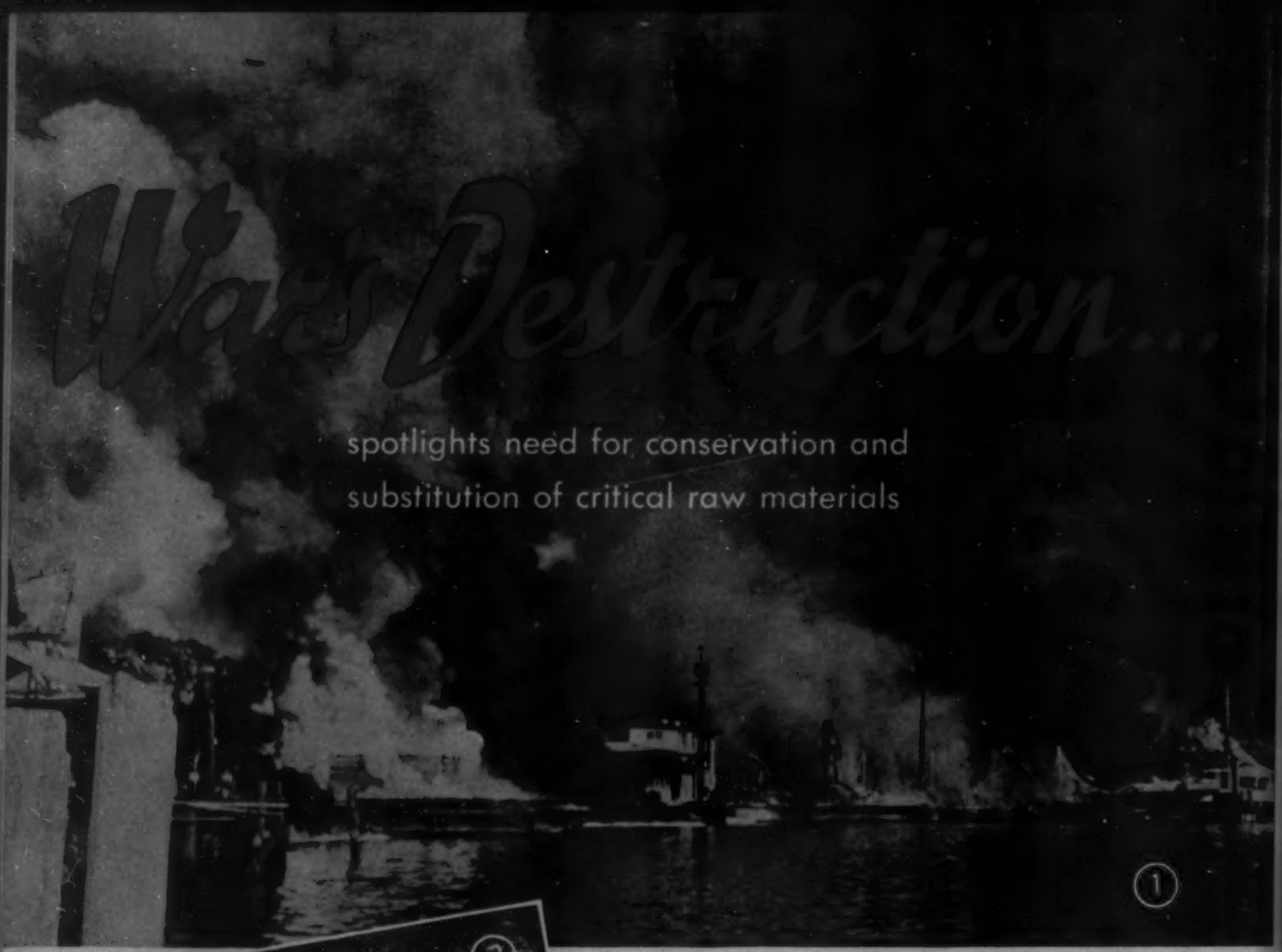


Fig. 1—To replace vital war materials lost, it is necessary to employ every possible means of conservation. This U. S. Army Signal Corps photo shows result of Japanese attack on Cavite Navy Yards, Philippine Islands, Dec. 10, 1941. Barge No. 181, right center, is loaded with burning torpedoes. Small arms ammunition is exploding in center of heavy blaze on left

Fig. 2—Libyan campaign. Bombed Axis merchant vessel sinks in harbor after fierce attack by Allied air forces on day Bardia was recaptured. British official photo

Fig. 3—British gunfire set this German radio truck burning fiercely. British official photo taken during big raid far behind enemy lines in western desert in North Africa

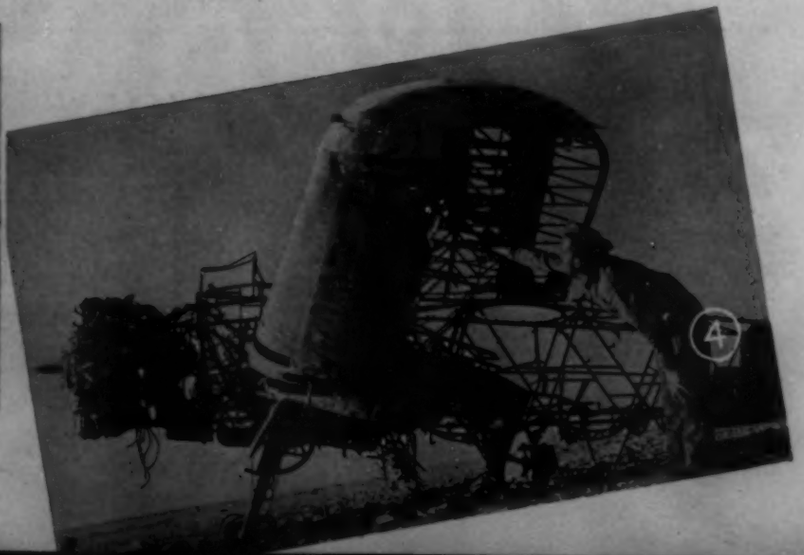


Fig. 4—Inspecting wrecked skeleton of an Italian plane shot down in Libyan desert. British official photo

Fig. 5—Bombed truck still burning off Hickam parade ground, Hawaii, at 11:15 A.M. Dec. 7, 1941. U. S. Army Signal Corps photo

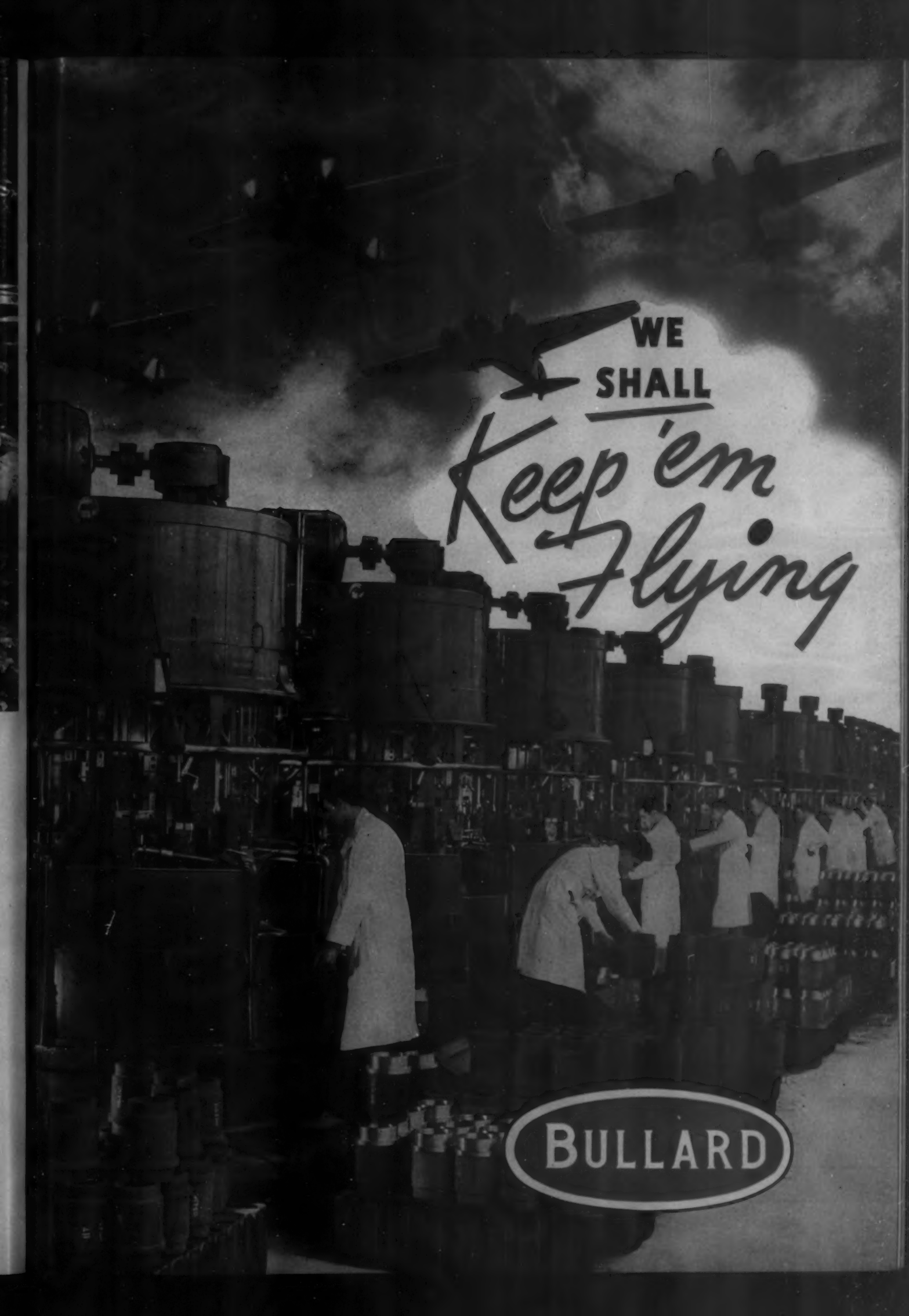
Fig. 6—One of many Messerschmitts brought down by an Australian fighter squadron operating over the western front. British official photo

Fig. 7—Remains of tents and barracks after fire caused by Jap attack on Wheeler Field, Hawaii, Dec. 7, 1941. Practically all were killed by machine gunning. U. S. Army Signal Corps photo

CONSERVATION and SUBSTITUTION In Ordnance Work

Fig. 8—Wreckage of Jap plane shot down near CCC Camp in Hawaii the morning of Dec. 7, 1941. U. S. Army Signal Corps photo

Fig. 9—Collection of Axis guns captured near Tobruk. Some show results of effective British range-finding. British official photo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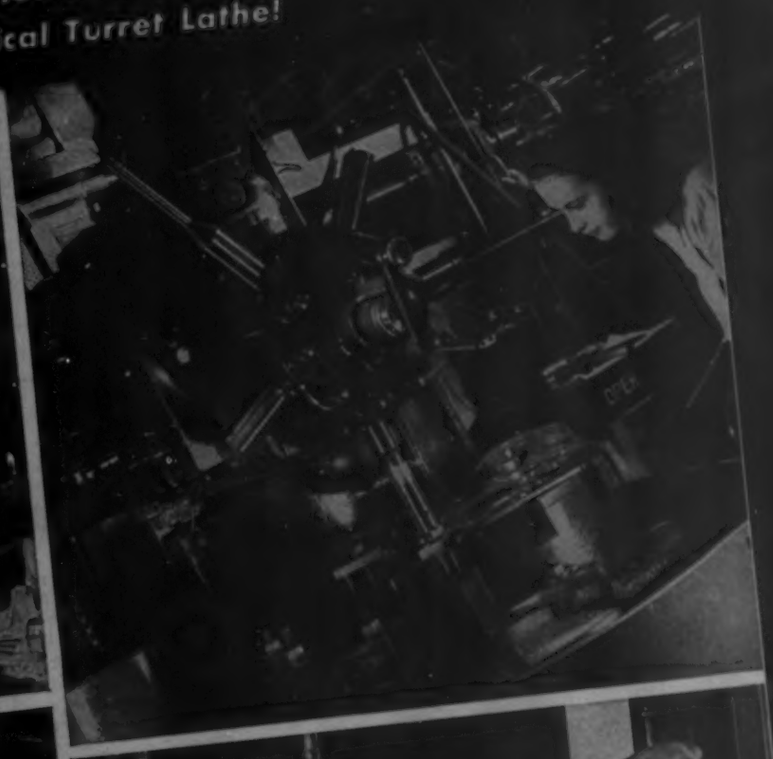

CALL ON

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The Ordnance Department

. . . . and its conservation control program

TWO YEARS ago the Ordnance Department recognized the need for centralized conservation control and set up a program whereby every part of component containing 1 per cent or more of any strategic metal or alloying element was closely examined and substitutes made mandatory wherever possible.

This huge task is still very much in the active status. Already literally millions of drawings and specifications have been reviewed and revised. The organization accomplishing this important job was established by order of Chief of Ordnance Major General L. H. Campbell Jr. who set up a conservation unit in each of the four operating divisions—Tank and Combat Vehicle Division, Small Arms Division, Artillery Division and Ammunition Division. At the same time, a central authority was organized to co-ordinate and supervise the activities of all of these various division units.

Ordnance Department men concerned with conservation work include Brigadier General G. M. Barnes, assistant chief of industrial service in charge of research and engineering; Deputy Chief, Technical Division, Colonel Wm. A. Borden; Executive Assistant Major H. S. Turner; Service Branch, Colonel S. B. Ritchie; Materials Section, Lieutenant Colonel J. H. Frye; Conservation Section, Mr. H. M. Huxley.

Associated with members of the Ordnance Department conservation units are outstanding civilian engineers in the various technical fields of diecasting, stamping, plastics, grey and malleable iron castings, welding and the like. Committees from professional and engineering societies also act in an advisory capacity and assist with the solution of design and materials problems.

Major General L. H. Campbell Jr.

Made Chief of Ordnance June 1, 1942, for a 4-year term, General Campbell was born in Washington, Nov. 23, 1886. Graduated from United States Naval Academy in 1909, he was appointed second lieutenant, Coast Artillery Corps in 1911.

Promotions: To first lieutenant, 1916; to captain 1917; to major (temporary), 1918; to lieutenant colonel (temporary), 1918; reverted to captain, 1920; promoted to major, 1920; to lieutenant colonel, 1935; to brigadier general (temporary), 1940; to major general (temporary), 1942; to major general (permanent), June 1, 1942.

Service: Fort Monroe, Va.; Fort Williams, Me., till 1915; Panama Canal till 1918; to Office of Chief of Ordnance till September 1920; to Stockton, Cal., to study artillery materiel production at Holt Mfg. plant till summer of 1921; to Aberdeen Proving Ground, Md., as proof officer in charge of tanks, tractors, self-propelling mounts and mobile artillery till September 1923; in charge of Design Section, Rock Island arsenal, till April, 1926; in charge of Automotive Section, Artillery Division, Office of Chief of Ordnance till June, 1930;

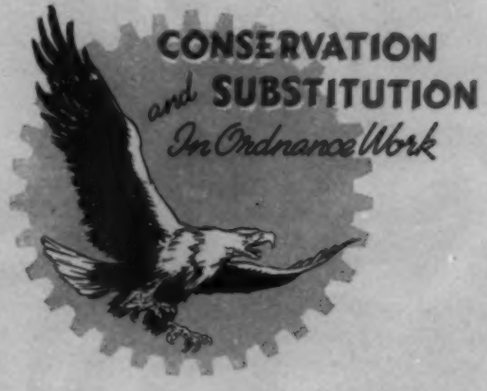
Then he was officer in charge of manufacture at Rock Island Arsenal till June, 1935; in charge of Artillery Ammunition Department, Frankford Arsenal, Philadelphia, until summer of 1940; Assistant Chief, Industrial Service Facilities to Oct. 1, 1940; in charge of Development of Facilities, Office of Chief of Ordnance, to June 1, 1942 when he became Chief of Ordnance.

Brigadier General G. M. Barnes

Assistant Chief of Industrial Service in charge of engineering and research since July 10, 1940, General Barnes was born in Vermontsville, Mich., graduating from the University of Michigan with a bachelor of science degree in civil engineering in 1910. He also attended Ordnance School of Technology, 1914; Ordnance School of Application, 1916-17; Army Industrial College, 1935-36; Officers' Course, Chemical Warfare, 1936-37; Army War College, 1937-38. He received an honorary degree (Master of Engineering) from University of Michigan, June 1941.

Promotions and Service: Second lieutenant, Coast Artillery, United States Army, 1910; first lieutenant, Coast Artillery and Ordnance Department, 1913-16; captain, 1916-17; major, Ordnance Department, National Army, 1918; lieutenant colonel, Ordnance Department, 1918; in charge of design and production of railway and seacoast artillery, 1917-21; assistant ordnance officer of American forces in Germany and inspector of foreign munition plants and materials in European countries, 1922; charge of development of anti-aircraft artillery, 1922-27; inspector at government ordnance and manufacturing plants in Europe, 1928; chief engineer, Watertown Arsenal, in charge of development and engineering, 1928-32; chief proof officer, Automotive Division, Aberdeen Proving Ground, Md., 1932-35; in charge of procurement planning, office of Assistant Secretary of War, 1936-37; chief of Technical Staff, 1939-40.

Member of Newcomen Society of England, Army Ordnance Association, Tau Beta Phi. Conservation is one of General Barnes many responsibilities.



Lieutenant Colonel J. H. Frye

The onerous task of making the best possible use of our available supplies of copper, tin, aluminum, zinc, lead, tungsten, vanadium, etc. in the manufacture of tanks, guns and ammunition required by the Army rests upon the shoulders of Lieutenant Colonel J. H. Frye as head of the Materials Section.

Still comparatively young (he graduated from Ohio State University in 1926, in Metallurgical Engineering), he has had a varied industrial experience as metallurgical engineer with Columbia Steel & Shafting Co.; Edgar T. Wards, Sons & Co. and elsewhere. He entered the Ordnance Department Oct. 1, 1940, with rank of Major and was promoted to Lieutenant Colonel in February, 1942. On leave from his firm, he expects to return to industry after the war.

Below: U. S. Army Signal Corps photos

WHERE

To Research America owes much of its ability to convert a huge peace-time production industry to today's war needs. Out of the patient and persistent study by research engineers for better things to improve our way of living has come a knowledge from which the tools of war and victory are forged.

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COMBUSTION

NITROGAS-FIRED SPACE HEATING EQUIPMENT • AND KATHABAR SYSTEMS FOR DRY BLAST

The WHY and HOW of

CONSERVATION and SUBSTITUTION In Ordnance Work

By ARTHUR F. MACCONOCHIE
Head, Department of Mechanical Engineering
University of Virginia
University Station, Va.
And
Contributing Editor, STEEL

What is conservation? Supply and demand in ordnance; some materials cannot be replaced; changes in design; acute need for conservation now upon us; savings—past, present and prospective

(Section I in a Series on Conservation and Substitution in Ordnance Work)

NATURE of the effort to conserve strategic and critical materials and some conception of its vast significance was first brought home strongly to the writer about a year ago on his appointment as a member of the special research committee of the American Society of Mechanical Engineers on the forging of steel shell bodies—one of the civilian committees associated with the Ordnance Department. Since then he has had valuable opportunities for first-hand observation of this problem and its progressive solution by Brig. Gen. G. M. Barnes and his assistants. Much has been done by the joint effort of industry and the Army; much remains to be done. Carping criticism does not help, but thoughtful and understanding co-operation will. (See p. 160 and 161.)

All that conservation implies might be summed up by observing that a certain result in terms of planes, tanks, guns, ships and shell must be achieved by the most economical application of available materials. When we speak of a certain result, we think no longer in the familiar terms of peace-time sufficiency; rather do we visualize the victorious conclusion of this struggle, whatever be the cost. And by economy we do not mean a saving in dollars and cents, but in the life blood of our fighting men. Truly we live in a topsy-turvy world where the old familiar landmarks of value have largely disappeared and where new measures of worth have taken their place.

If we could take a bird's eye view of the stock piles, both actual and potential, of all the substances which are required for the complex tools of war; and if at the same time we had an understanding of the demands upon them, we could more readily adjust our thinking to the realities of the case. Suppose, for example, we cast our eyes upon our stockpile of vanadium. We will note that by no possibility can we meet prospective requirements based upon existing specifications. Clearly some changes MUST be made; *and made without any sacrifice of quality*. This is of the first importance.

Or let us turn to the copper pile. Once more we observe that the exercise of the greatest prudence in its use cannot reconcile supply and demand if we continue to specify brass for cartridge cases. So we turn to our gigantic, but not inexhaustible, reservoir of steel and substitute one critical material for another which can more readily be spared. So it goes from rung to rung down

Fig. 1—"God help me if this is a dud." Conservation does NOT mean the substitution of inferior material. The exacting standards of quality which are providing the American soldier with the finest fighting tools in the world are being maintained rigidly. Figs 1 to 6 are OEM photos, by Palmer

Fig. 2—"Slow down, Adolph! The road ahead is blocked." There is no better gun in the armies of all the warring nations than the American Garand. No specification changes have altered or will be permitted to affect the fighting qualities of this deadly weapon

Fig. 3—Machine gunner. We may yet make these small arms cartridge cases and bullet envelopes of steel, but not until the present exhaustive experiments and tests conclusively demonstrate its adaptability

Fig. 4—Cartridge cases for 3-inch anti-aircraft guns. Copper of which we are short, constitutes 70 per cent of the billions of brass cartridge cases we need. Intensive research and experiment have produced a successful steel case, adequately proofed against chemical interaction with the powder charge

the new measure of worth where only war values count.

The strangeness of our situation may best be understood by noting that gold is not in the list with tin, magnesium, vanadium, molybdenum, aluminum, copper, tungsten, chromium, high-grade zinc, magnesium and steel—materials which the war machine demands. Now that lovely and relatively useless metal, which men have striven for through the ages and died to win, is of no consequence. Its very presence is merely an added incitement to our enemies . . . a monument to love's labor, lost in a hole in Kentucky. *How much better had we buried copper and tungsten and nickel!*

Well, these billions of man-hours worked in the fields of Africa, California and Alaska are over the dam, for now we face the problem of how best to allocate our accumulations of useful metals in a desperate endeavor to match supply and overwhelming demand.

The nature of this mighty task may be clarified at the outset by noting that many of our piles of critical material stocks are subject to replenishment from the natural resources of this fortunate land; but we are already painfully aware that other strategic essentials are sea-borne and cannot be replaced until sea and air lanes are cleared. While we can replenish some of these stock piles of strategic materials, others must inevitably decline. Thus should no relief come and the war last long enough, the bottom of these bins will finally be reached.

How is this problem approached? A first consideration, no doubt, would be economy in design and manufacture. A prime illustration of this latter thought is the work which has been done and is now in progress on saving shell steel.

In the ordinary course of manufacture, the high-explosive shell starts as a billet which is pierced and subsequently drawn or cross-rolled to form. By improvement in techniques, the initial weight of the billet may be reduced substantially. Likewise the percentage of components rejected can be cut. But this, of course, is only one facet of the solution, although an extremely important one in terms of steel tonnage.

When we ask the question, "Can the design be changed with advantage from the standpoint of material saving?" we are on more difficult ground. As a vivid and no doubt rather extreme case, consider the mechanical fuze, a device which has been more than 15 years developing and perfecting. Alterations, obviously, cannot be made on short order. What is true of this particular item is also true, in greater or less degree, of most war materiel (especially ammunition components). For the sake of illustration, suppose we cannot tolerate more than one premature explosion of the shell in the barrel of the gun in hundreds of thousands of rounds, how many rounds have to be fired before the design can be accepted.

The third major approach to conservation is by way of the substitution of one material for another. On the face of it this would seem to be the most hopeful of all; but because of differences in the physical properties between

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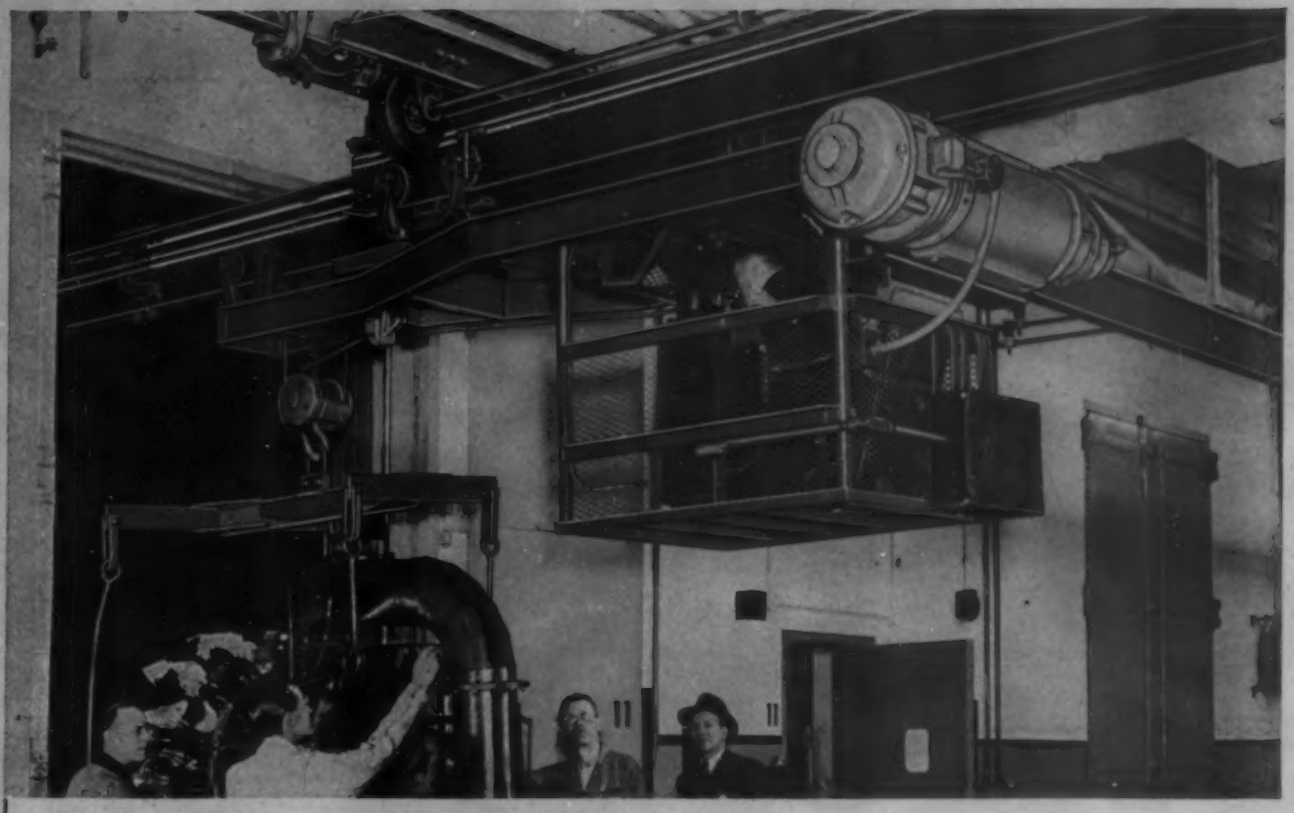

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one metal and another, or between some particular alloy and a plastic, it may be necessary to modify the design of the part or the unit. For instance, zinc alloy has been proposed for fuzes to replace brass and aluminum. As far as strength and impact resistance are concerned, this substitution could be made, but because of a difference in density, the center of gravity of the entire shell assembly is changed and the ballistic characteristics altered.

When the use of alternate materials is possible, there are three natural divisions into which components under consideration fall. In the first and most favorable case, no design changes are necessary, and limited testing only is necessary before acceptance. Next in order come those parts which have to be redesigned and consequently require more extended tests; and finally we become involved both in design changes and extensive development work. It is therefore reasonable to inquire how this situation has arisen and why our present condition was not foreseen.

If Mr. Average Citizen will cast his mind back to the two decades which preceded our virtual entry into the present war, he may remember our sincere efforts to encourage peaceful relations with the rest of the world by what has proved to be the misguided policy of failure to prepare for the inevitable. Not only were private armament firms the object of attack, but the Ordnance Department itself was obliged to subsist on the most meager appropriations for the maintenance of its many arsenals. Consequently ordnance design engineers were largely restricted to manufacturing methods which could produce parts in relatively small quantities and which were less well adapted to the stamping, diecasting and powder metallurgy techniques of mass production.

Probably no one, in his wildest imaginings, even if he felt another world war to be inevitable, had the remotest conception of the amount of assorted hardware the greatest war of all time would require. Is it surprising, then, that ammunition fuze components were designed to be machined out of solid aluminum and brass bar stock, when they could, under present conditions, be made more quickly and economically by diecasting or from plastics? Shall we be critical if forgings were specified when the less critical steel stamping must now be employed? Was the use of aluminum and brass castings an error of judgment when malleable and gray iron would suffice? Expediency, at least, played no part in these decisions; at the most the charge of a certain lack of imagination might be leveled. But who among us will be the first to make it?

While much of the foregoing has an important historic interest and may serve as a valuable object lesson in years to come, no useful purpose is served by crying over spilt milk. Nearly two years ago the need for conservation was recognized by the procurement services and a large and extending program instituted. In the early days aluminum, magnesium, nickel and zinc alone came within its purview; now practically all materials required by the fighting services—even steel itself—are included.

This centralized conservation control first initiated a survey of all ordnance materiel. Every part or component containing one or more per cent of strategic metals or alloys was listed on forms prepared for the purpose and from the information so secured, substitutes of less critical for more critical materials were indicated wherever possible, *and their use made mandatory*. Concurrently, existing specifications and drawings were rewritten and revised in accord with these decisions. How extensive this task is may be judged from the fact that literally millions of drawings must be reviewed.

The mechanism by which this job is being accomplished was set in motion by an order of the Chief of Ordnance, establishing a conservation unit in each of the four operating divisions, viz., the Tank and Combat Vehicle Division, the Small Arms Division, the Artillery Division and

Fig. 5—Back to the days of the stegosaur. All that American ingenuity and engineering experience can suggest is built into this hard-hitting, well protected tank. If one alloying element for the armorplate becomes scarce, we select another that gives equal or superior results. Note the welded hull

Fig. 6—Closing the breech of a 16-inch howitzer at an eastern coastal fort

Fig. 7—Streamlined to face shell fire. Cast steel hulls are giving as good an account of themselves as those fabricated from rolled plate. Rolling mill capacity thus is conserved and enemy shell get less of a "bite" from these curved surfaces. Office of War Information photo, by Palmer

the Ammunition Division, and a centralized authority—a function of technical service—set up to co-ordinate and supervise the activities of the division units. Associated with members of the Ordnance Department conservation unit are civilian engineers of high reputation in the automotive, diecasting, metal stamping, plastics, gray and malleable iron castings, welding and other fields, together with committees of various professional engineering societies who not only act in an advisory capacity but assist with design and materials problems.

As supplies flow in mounting volume to the battle fronts the allocation of available metals and other materials enters a more intensive phase. In this sense, the task of conserving essential raw and semifinished products has just begun. It may be of interest to record, however, that up to this present time, the following known savings have been made:

Nickel	49,000,000 lb.
Chromium	9,700,000 lb.
Vanadium	1,250,000 lb.
Tungsten	17,300,000 lb.

In addition to these alloying elements,

170,000,000 lb. of primary aluminum
12,000,000 lb. of tin
60,000,000 lb. of rubber and
700,000,000 lb. of copper

will be conserved on the basis of our requirements for the remainder of this year and through 1943.

The steel cartridge case will show how conservation works. Despite the undeniable skill of the Germans, who have been at war for three years, analyses of the alloy steels from captured planes show no evidence of a decline in quality. They do not appear, however, to have been as successful in the substitution of steel for brass cartridge cases as we. Advices to hand indicate that these German cases stick in the chamber of the gun and occasionally have to be dislodged by ramming. This cuts the rate of fire materially and prevents their employment in barrage and other rapid fire. Despite rumors to the contrary, our cases are every bit as satisfactory as those made of brass, and production orders have been placed with more than 45 manufacturers.

As many people are aware, the cartridge case performs several functions. Primarily it serves as a weather-proof container for the propellant charge; but by "obturation"—that is, expansion against the tapered walls of the gun chamber at the instant of firing—it also serves as a gas check. After this action, the case must not rest ballooned against the gun, but must possess sufficient resilience to contract and permit its ready withdrawal. This is not a characteristic which is easy to develop, but American industry, backed by the experience of Army Ordnance proved equal to the task.

We are not at liberty to divulge the exact means by which this result has been achieved, but we can say that the case consists of a single piece. All previous attempts, in Europe and elsewhere, to fabricate this item by welding on the head to the body, for example, have ended in failure. Difficulties of extraction and failures by bursting have attended all such efforts. Nor did the attempt to force the partially closed end of the steel body into a brass head meet with any better success.

Thinking this problem over, and being aware of the wreckage of past hopes, the average engineer familiar with deep drawing and extrusion processes would probably select a high-quantity low-carbon steel and attempt the formation of the cup by familiar methods. Thereafter by careful attention to annealing in which spheroidized structures played a large part, the case could be drawn cold in a more or less well established series of drawing, tapering and necking operations.

Other interesting case histories of conservation include the redesign of the 90-millimeter anti-aircraft gun platform to save aluminum and of the tank track to save rubber. In the former case steel was substituted without increase in the time required for the battery to go into action. Indeed a few seconds were actually saved. While in the latter many thousands of tons of rubber were saved by various substitutions in the shape of castings, forgings, etc. This particular problem was complicated by the fact that bottlenecks in the forge and foundry and also the machine shop necessitated the development of several different designs.

Needless to say, the many changes forced upon us by the necessities of conservation have been made without sacrifice of either safety or quality. We all remember the ancient adage, "For lack of the nail the shoe was lost. . ." Translated into modern terms, the failure of the fuzes in an airplane bomb is something we must take every possible precaution to prevent. In general terms, war materiel must function with the highest degree of efficiency and reliability when the need arises. A lack of appreciation of the point of view of the ordnance engineer is thus the cause of occasional criticism of his attitude toward conservation.

One of this machine's last operations is to "burnish" nuts (which have already been punched). This process—originated and perfected by R B & W engineers—compresses and actually burnishes the skin surface of the metal for improved appearance and maximum resistance to wrench abuse.

Tougher skin for holding the reins on iron cavalry

"FOR WANT OF A NAIL . . ." You remember the lines about the battle, and the Kingdom, lost because the horse became unshod.

In modern warfare, *one* broken bolt, *one* loosened nut won't lose the fight . . . but multiply such mishaps by the carload and listen to the Axis laugh!

You see why the automotive firms now making tanks, the farm equipment manufacturers now making mobile guns . . . insist on shock-resisting, tight-gripping R B & W bolts and nuts.

Flawless metal to start off with . . . cold-headed or cold-punched on R B & W-designed machines that maintain the flow of the metal's grain . . . threaded or tapped and finished by methods that preserve the metal's toughness.

The workers in our three great plants . . . one of them undoubtedly the world's largest, most modern plant for making cold-punched nuts alone . . . are straining every muscle and machine to keep well ahead of the factories that make such products for Hitler and Hirohito.

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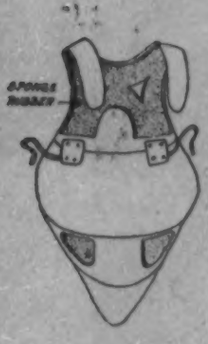
Conserving the Alloying Elements of. . .

LIGHT

Armor—ancient and modern; is body armor practical today; various types of light armor; how percentages of alloy content are being reduced; armor plate testing methods; data on savings of nickel, chromium and vanadium

(Section II in a Series on Conservation and Substitution of Critical Materials in Ordnance Work)

IN DAYS of old when knights were bold, the employment of light armor enabled the one horsepower prototypes of our modern tanks to over-run Southern Europe and conquer the Holy Land, and at a much later date aided the Spaniards in their destruction of the ancient Aztec civilization of Mexico. But the advent of the gun tended to neutralize the advantage possessed by armored forces. Indeed so violently had the pendulum swung in the direction of mobility as opposed to protection that during the last world war masses of men exposed their unprotected bodies to artillery and machine gun fire and suffered apalling casualties, while Winston Churchill pled desperately for the introduction of the tank.



Looking backwards over these troubled years, it seems rather strange that the advances in metallurgy which had made the armored ship worth while were not more quickly put to use by land forces. Even Germany with her dangerous mechanical aptitudes had not realized the potentialities of high alloy steels for this purpose; but she too turned the lessons of the first world war to account and succeeded in her surprising conquests of the countries of Europe with the aid of her mobile fleets of land cruisers.

By ARTHUR F. MACCONOCHIE
Head, Department of Mechanical Engineering
University of Virginia
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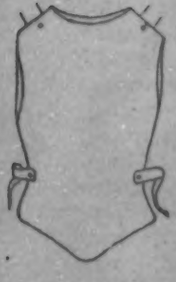
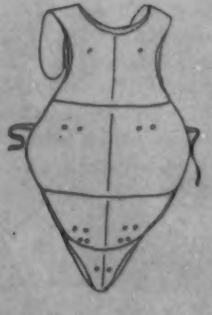
And
Contributing Editor, STEEL

While various attempts have been made to revive the use of *body armor*, it is rather generally agreed that, save for the "tin hat", protection is best afforded by an independent housing. During the last war the experimental work of the equipment section of the engineering division of the United States Army Ordnance Department experimented with various models of helmets and body armor designed to afford protection against missiles of low and middle velocity. Amongst these types were a laminated form having sponge rubber cushions to absorb shock through contact at points of the bony structure. This is shown in Fig. 2.



The jazeran, a scale type of flexible defense, fitting the body closely and worn either over or under the tunic is shown in Fig. 1. One model of the latter successfully withstood



Note: Views and observations set forth in this article are those of the author. Although this material has been reviewed and released for publication by the War Department, no statments herein are to b construed as emanating from the War Department.

Fig. 1. (Top two, at left)—The jazeran, a flexible type light body armor designed to be worn either over or under the tunic. Armor of this type has successfully withstood the impact of bullet traveling 800 feet per second fired from an automatic pistol at 10 feet. Wounds causing a high percentage of deaths from hemorrhage during the last war could have been prevented by such protection. Medieval form of chain mail might be helpful. It could be made from austempered plain carbon steel wire, using no critical alloys. Austempered steel has given

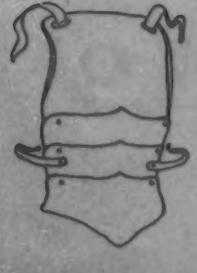


Fig. 2. (Lower sketches at left)—Various designs of light body armor for protection of the breast, abdomen and back. This laminated type was proposed and designed by Engineering Division of the United States Army Ordnance Department during World War I. It was intended as a light body defense that would not hamper movement yet would be proof against missiles o flow or medium velocity. Sponge rubber cushions helped absorb shocks

Fig. 3. (Opposite page)—Piece of armor plate tested at Aberdeen proving grounds. Armor must not crack. When velocity of projectile is stepped up to point where it pierces armor completely, a clean hole must be punched, spalling is not permitted. Photo furnished by Life magazine

ARMOR STEEL

Fig. 4. (Left)—Outcrop of chromite in California. From Bureau of Mines, Department of Interior

Fig. 5. (Above)—Quartz vein by miner's head carries molybdenite. At Crown Point Mine, Railroad Creek, Chelan Co., Washington. Bureau of Mines photo

an automatic pistol shot at 10 feet, traveling at 800 feet per second. A careful review of the results of these experiments led to the conclusion that a steel helmet was universally demanded but a body defense was only required to a limited degree. Armor for arms and legs, while produced in experimental lots, notably in France, was not recommended for active service.

More recently—in 1940—some work was carried out in this country, using laminated sections of 0.65 per cent carbon, 0.65 per cent manganese, 0.025 inches thick. A number of these pieces were austempered to various hardnesses ranging from 48 to 63 rockwell C and exhibited definite superiority to the usual quenched and tempered materials. Nothing further appears to have been done.

Light armor less than one and a half inches thick such as for tanks and motorized transport must possess the ability to defeat the projectile and resist cracking or shattering on impact. Then it must be sufficiently "tough" to avoid spalling on the inside and throwing buttons and slivers among the crew of the vehicle.

Cast armor has been used to a limited extent in recent years, especially where complicated shapes are concerned. Now its use is being rapidly extended partly on account of the need for conserving rolling mill capacity but also because it is more readily possible to "streamline" the contour of the tank and so offer encouragement to glancing blows.

Homogeneous plate, like cast armor, is consistently hard throughout. Thus some sacrifice of toughness and ductility is essential if the necessary degree of hardness is to be attained. Face-hardened plate is only used to a limited extent in our service. While the resistance offered to the projectile is enhanced and its resistance to injury under repeated impacts is high, it raises rather serious problems of heat treatment, manufacturing losses as a result of warping and cracking being rather high.

In the past the United States Army Ordnance Department has required only that armor in all classes meet certain ballistic requirements, no attempt having been made to control analyses or processing methods. As a result, the manufacturer has used his own good judgment in the selection of his steels, all of which, however, were rich in nickel, chromium and vanadium.

Had not an early determined effort been made towards conserving these critical alloying elements, there would actually have been an insufficient quantity available for the manufacture of the required quantities of armor alone. In this connection, the Tank and Combat Vehicle Division compiled the compositions used by the various manufacturers and decided that some reduction in alloy content could be made without impairment of ballistic quality.

Early this year the Steel Branch of the War Production Board was alert to the terrific drain upon our supplies of alloying elements demanded by scheduled armor tonnage. Upon their advice the Tank and Combat Vehicle Division established temporary maximum limits, based upon their earlier surveys of all types of armor. But since the minimum percentages of critical alloys which could be used without affecting ballistic characteristics was uncertain, a development program was inaugurated through the cooperation of the sub-committee of the Ferrous Metallurgical Advisory Board.

This program consisted, first of all, in the selection of the various armor steel analyses for investigation, together

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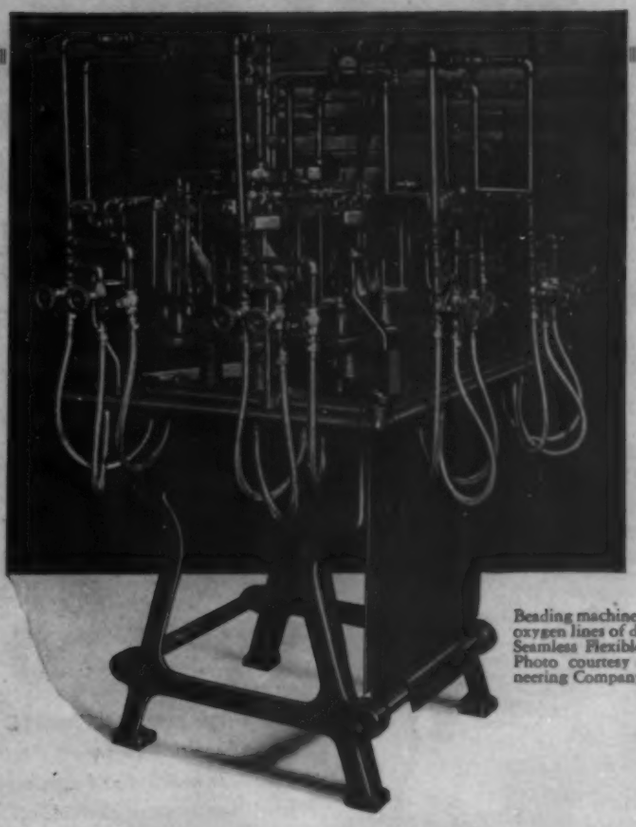

Beading machine with air, gas and oxygen lines of durable American Seamless Flexible Metal Tubing. Photo courtesy of Kahle Engineering Company.

Frequent backfiring in the air, gas and oxygen lines on beading machines like the one above could seriously interfere with transmitter tube production . . . if the lines were not of American Seamless Flexible Metal Tubing.

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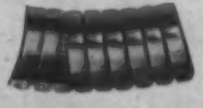

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Fig. 6—Light rolled armor plate forms body of this half-trac scout car seen here towing a 37-millimeter gun

with a determination of their sources and physical characters. This was followed by a discussion of the manufacturing and heat-treating processes used by the manufacturers and a comparison of these methods with the techniques developed by the Ordnance Department. Thereafter decisions were reached as to the quantity of each analysis to be produced and the variations of heat treatments to be used with each analysis. The nature of the necessary ballistic tests was then determined.

Ordinarily these tests consist in mounting the plate under test in a rigid frame and firing from 100 yards, the powder charge being adjusted to secure the desired impact velocities. Against 0.375 inch plate, .30 caliber armor-piercing ammunition is used, full automatic in a burst of 25 rounds. Above 0.375 inch and including 0.625 inch plate, .50 caliber armor-piercing bullets are employed; while plates up to and including 1 inch are struck with armor-piercing solid shot at points not less than 6 inches nor more than 15 inches apart.

In all cases, the development of cracks at the time of the test or within 24 hours, or any evidence of lack of ductility indicated by spalling or crumbling or the absence of a smooth entrance and exit hole will cause rejection. Resistance to penetration is similarly determined with thicker plates, failure occurring if the bullet passes through the plate or makes a hole deep enough to admit light.

Perhaps the most spectacular results of this conservation work have been achieved in the case of cast armor, from which it has been found possible to eliminate vanadium completely and to reduce the nickel and chromium contents to an extremely low percentage. Tests on rolled homogeneous armor plate are near completion and it already is evident that nearly as great a reduction of critical alloying element percentages can be made in this case. Rolled face-hardened armor, however, requires additional development and tests, and it is considered likely that a somewhat richer alloy containing especially nickel and vanadium will be necessary. *However, there are rather definite indications that savings of more than 50 per cent of the amounts of these elements formerly thought necessary may be made.*

Although the work of development in all three classes of armor is not complete, the total savings based on the Army supply program of April 6, 1942, will amount to:

37,000,000 pounds nickel
21,000,000 pounds chromium and
1,250,000 pounds vanadium

Should it be found possible to reduce alloy content still further, additional substantial economies will be effected.

As far as nickel is concerned, our domestic production includes only minor quantities of secondary metals recovered from scrap nickel anodes, nickel-silver, and copper-nickel alloys (including Monel metal) together with small quantities of primary metal recovered in copper refining. Our output on both counts is very small, the former rising from 1965 tons in 1936 to 2920 tons in 1940, the last year for which figures are given. Our production of primary nickel in that year amounted to but 554 tons, while our net imports were in the neighborhood of 80,000

As early as 1940, despite our record imports, a tight situation had developed as a result partly of a tendency on the part of domestic consumers to acquire unnecessarily large stocks, but also on account of increased production of nickel products.

Fortunately for us the principal source of the world's nickel supply is Canada, her production in 1939 being 105,286 tons of a world total of 127,000 (the last year for which this figure was available). The only other producing countries of any importance were Burma (959 tons), Greece (1207 tons), New Caledonia (11,700 tons) and Norway (1245 tons).

The chief ores of nickel are the silicate ores of New Caledonia (garnierite) and the magnetic pyrites containing nickel and copper found in Ontario. The silicate ores can be treated by direct reduction, while the magnetic pyrite ores are first smelted to form matte. In the Orford process used by the International Nickel Company of Canada, Ltd., the ore is ground fine, then classified and roasted in Herreshoff roasters. Smelting in reverberatory furnaces follows, the resulting matte being charged into converters with a silicious flux in order to produce a liquid slag which carries off the iron.

The bessemer matte thus produced is fused with sodium sulphide or sodium sulphate and coke. Solidification takes place in two layers, the upper containing copper and iron sulphides and the lower nickel sulphide. Resmelting of these "tops" and "bottoms" progressively purifies the product, the sodium sulphide being recovered from the tops in refining the copper.

This latter is blown to blister in basic lined converters

Fig. 7—Closeup of M-3 tank showing portions of cast armor forming the hull and turret. Certain sections such as gun mounts and shields are bolted in place for quick replacement in the field. Figs. 6, 7 and 8 from United States Signal Corps

and then refined electrolytically; while the bottoms, containing nickel sulphide and a small percentage of copper are washed to remove the mechanically enclosed sodium salts and roasted to remove the sulphur. The oxide is reduced to metal in reverberatory furnaces and cast into anodes for electrolytic refining.

Cast armor manufacturers have used as much as 2.5 per cent of nickel in various combinations in the past. In homogeneous rolled armor, percentages up to 4.5 have been employed. Other alloying elements include chromium, molybdenum, vanadium and, in the case of cast armor, copper. While these elements were plentiful, it was obviously better for the manufacturer to err on the safe side than have his product rejected, nickel having the effect of raising the elastic limit of steel with but little decrease in the ductility. Nickel, apparently, has the ability to dissolve in all proportions in alpha iron and render the ferrite tougher and more shock resistant. It may also be present to some extent in the carbides.

When chromium is also present, the resulting alloy possesses the valuable qualities of both nickel and chromium steels, the addition of chromium increasing the hardness and depth of the hardened layer after quenching. As much as 3 per cent has been used by cast armor manufacturers before the necessity of conservation forced a large immediate reduction and eliminated vanadium altogether. It has been claimed that the presence of a small amount (0.15 per cent) of vanadium increases the soundness of castings and tends to free them from occluded gases. It is also believed to refine the grain and accentuate the desirable effects of nickel and chromium.

In this mighty struggle of the mechanized powers for mineral self-sufficiency, the need for chromium plays an important part. With the sole exception of Russia, all the "great powers" must look elsewhere than their immediate national territories. In years gone by, our principal source of chromite ($FeO\ Cr_2O_3$) has been Southern Rhodesia; but we have also drawn upon India, South Africa, New Caledonia, Cuba and Europe.

High grade ores, the only ones normally of value commercially, have a chromic oxide content of some 48 to 55 per cent, the proportion of iron being about 2½ to 1. Such domestic ores as we possess contain on the average only about 40 per cent of chromic oxide and have a relatively high iron content, rendering them less valuable from a metallurgical standpoint.

For addition to steel, the ore is converted to ferrochromium, generally containing about 60 per cent chromium and 30 per cent iron, the remainder being principally silicon and carbon. It is added to the molten steel in the furnace in the proper proportions to give the desired chromium content. Since it is easier to manufacture ferrochromium with high carbon content, that grade is used which gives the required chromium content without raising the carbon percentage above the prescribed maximum.

As far as vanadium is concerned, there would seem less reason for economy, since American interests normally control around 76 per cent of the world's output, some 60 per cent of our needs being supplied by Peru and the rest emanating from domestic sources. In recent years attention has been devoted to the recovery of vanadium from other sources than the ore, however. Germany, for example, is reported to be obtaining vanadium from blast furnace slag in large enough quantities to render herself virtually independent of imports; and in Italy vanadium oxide has been successfully recovered from the caustic soda solution employed in the Bayer process of refining bauxite and from naphtha soot collected from the smoke stacks of ships and industrial plants. Here in America we have reports of the accumulation of considerable quantities of flue dust containing from 20 to 40 per cent V_2O_5 from the boilers of ships burning Venezuelan fuel oil. Vanadium ores of American origin are found in Arizona, Colorado, New Mexico and Utah.

The results to date of the work of the Cast Armor subcommittee have enabled us to produce armor which meets the required ballistic tests and which contains low percentages of chromium, nickel, molybdenum and, in a few cases, copper. Since we hear of the progressive use of molybdenum as a replacement alloying element for others which are more critical, it may be of interest to note that both nickel and chromium contents may be reduced in the presence of this element without lowering the physical standards.

In a recent visit to a plant engaged in the heat treatment and shaping of rolled tank armor, the writer was informed that these changes in specifications necessitated a more rapid transfer of the plate from the furnace to the quenching tank. While the practice had been to lower the armor plate into the bath, arrangements were

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Fig. 8—Here's what happens when certain types of armor plate are penetrated by shell fire. Note how the metal has spalled away on the inside and imagine the deadly result to the occupants. Size of hole can be judged from section of armored cable seen nearby. Many photos such as this have come from the Libyan campaign where some high velocity anti-tank guns are in action

being made to provide water sprays which would impinge upon the entire surface—both front and back—at the same instant. In this way it was hoped, warping of the plate would also be diminished.

If any additional evidence were needed that these United States are the pot of mineral wealth at the end of the Axis rainbow, our supplies of molybdenum provide it. In 1938—the last year in which figures on world production were generally available—we produced 15,103 metric tons (2204 pounds) of the world total of 18,387, Italy the only other important producer was responsible for 1560 tons. Prior to the war, at least, the Climax Molybdenum Co. of Climax, Colo., was the world's largest producer with an output which rose from 4600 metric tons in 1935 to 10,380 in 1940, our total domestic production rising in that year to an all time high of 15,570 metric tons.

The metal, molybdenum, has had rather an interesting history. It was first separated from molybdenite (MoS_2) in 1782 and was produced in appreciable quantities some 20 years later. However it was not until about 1880 that iron-rich molybdenum alloys made their appearance. From this time we hear of its application on increasingly numerous occasions, the World War I giving large impetus to its use. Since then its commercial use has grown rapidly.

When pure, molybdenum is a soft ductile metal not unlike platinum in color. It is introduced into the steel bath in the form of a salt such as calcium molybdate or calcium molybdenum silicate or as ferromolybdenum. Molybdenite is extracted from its usual low grade ores by fine grinding and flotation concentration. The concentrate containing some 50 per cent molybdenum and 35 per cent sulphur is calcined to remove the latter and the resultant molybdic acid (MoO_3) utilized as the base material from which the various compounds and alloys of commerce are produced.

The reduction in the percentages of alloying elements which has been found practical in the case of cast armor and rolled homogeneous plate is greater than the savings possible with face-hardened rolled armor. This type differs materially from the former in composition, heat treatment and ballistic properties, but the relatively small amount of thin section required makes percentage savings of smaller consequence.

The hard facing is accomplished by one or other of several nitriding or carburizing processes or by the use of composite plate. The outside surface must be extremely hard, this demanding a drastic quench in the heat-treating cycle. At the same time, warpage has to be held to a minimum in the interest of ease of assembly. In addition to possessing the maximum power to resist penetration, the same requirements prevail as to absence of spalling and shattering resulting from projectile impact as apply to other types of light armor. Fig. 8 shows result of projectile velocity sufficient to cause penetration and spalling.

Nickel contents as high as 5 per cent have been used, but a lower temporary maximum has been imposed, effecting a saving of some 1500 tons of nickel in this one application alone. This maximum content may be further reduced with increased experience with these declining percentages of alloying elements in this vital material.

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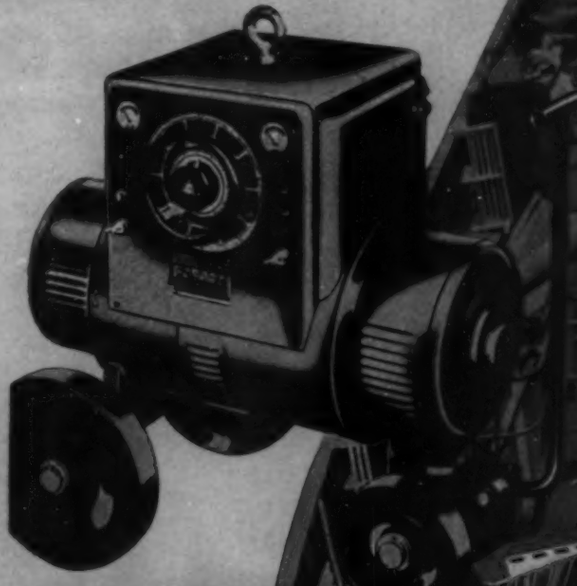

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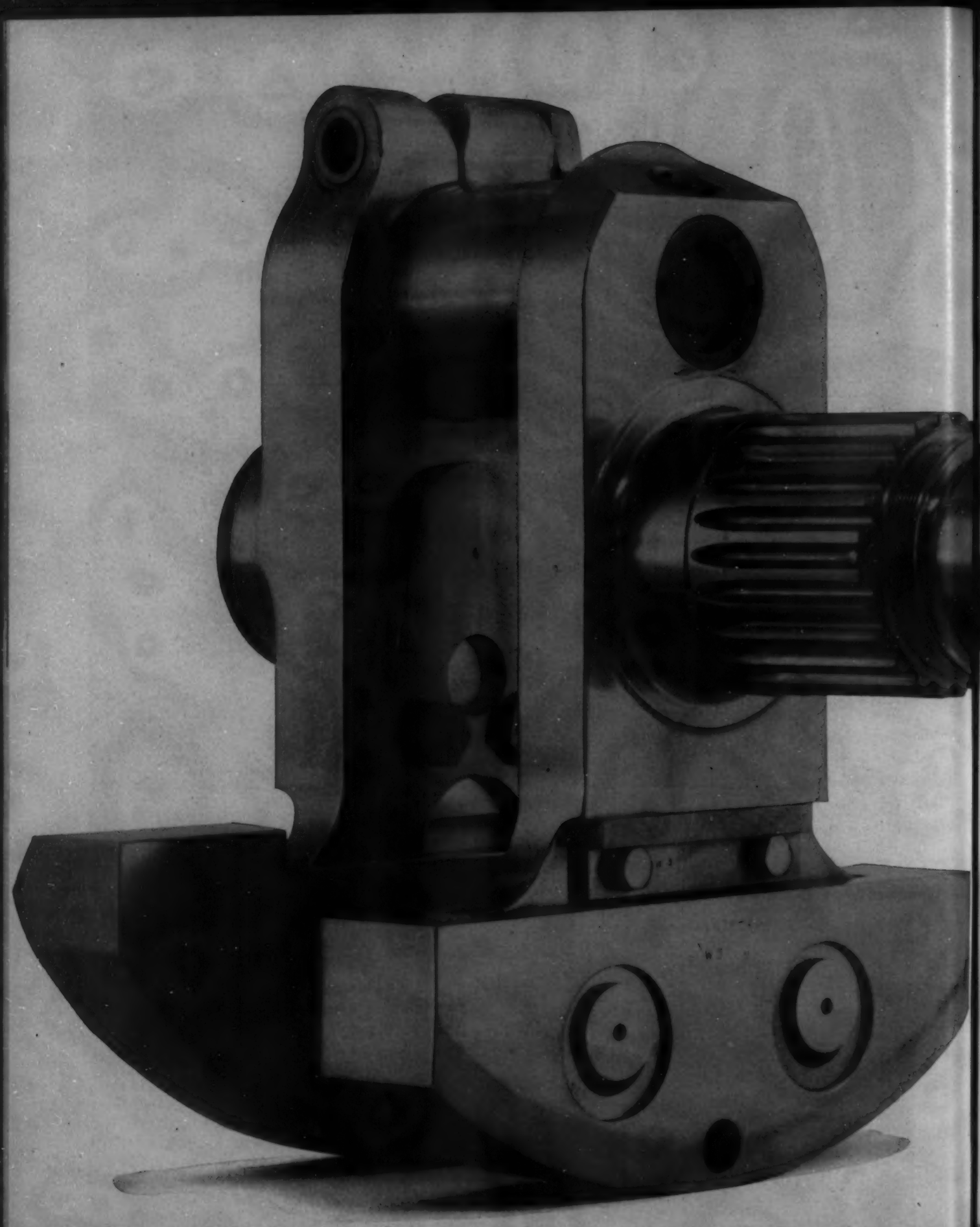

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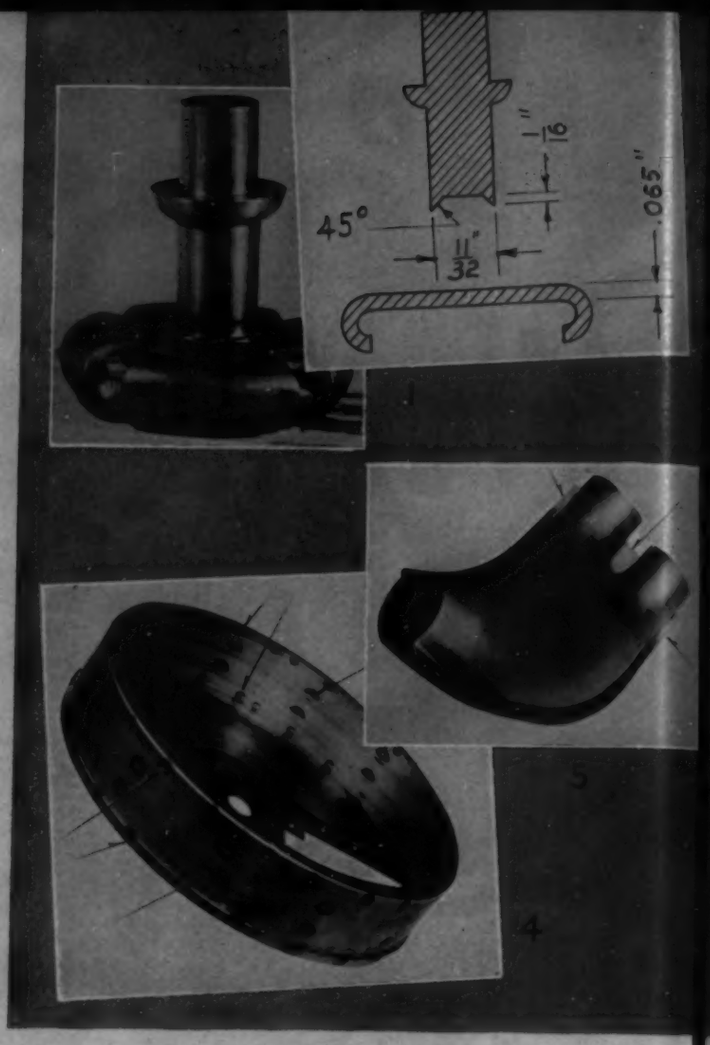
(Section III in a Series on Conservation and Substitution in Ordnance Work).

RESISTANCE WELDING *In War Production*

By R. L. WISE
Chief Electrical Engineer
Federal Machine & Welder Co.
Warren, O.



WAR REQUIRES use of those fabrication processes that will do the job more quickly, better, or with the fewest man-hours and the least skilled help. Resistance welding is one of these processes.

In discussing applications of the various forms of resistance welding to different types of war jobs, their general nature will be outlined briefly without revealing any restricted military information. Obviously some of the most important and the most interesting applications cannot even be mentioned. Of the resistance welding processes which are being used in our war program, the flash-butt welding process has promising possibilities, particularly in the field of heavy armament such as tanks, gun carriages, etc.

About ten years ago, a special flash-butt welder was developed for high-production welding of the longitudinal seam in the cylindrical portion of a barrel. An ordinary steel sheet, cut to size and preformed into a cylindrical shape with an open longitudinal seam, is welded to form a leakproof joint. This process came into considerable prominence during the early days of lend-lease aid to our allies. Exceptional production of these steel barrels was required for the transportation of oil, high-test aviation gasoline, petroleum products, alcohol, lacquers, chemicals, etc.

Flash Welding: Now this same type of machine is being used to produce ammunition boxes, depth bombs, chemical bombs, service containers, serial bombs and medium pressure vessels. In addition, many special welding machines have been designed to accommodate different shapes and sizes of cylinders, having a more concentrated cross-sectional area. The limiting factor in the welding of any closed shape by this method is the ratio existing between the various dimensions. The thicker the plate, or the longer the cylindrical portion of the part, the larger the diameter must be to accommodate the necessary clamp furnishing the clamping pressure. Powder drum rings, turret rings and many circular shapes formed from bar or plate stock are welded on machines of this nature.

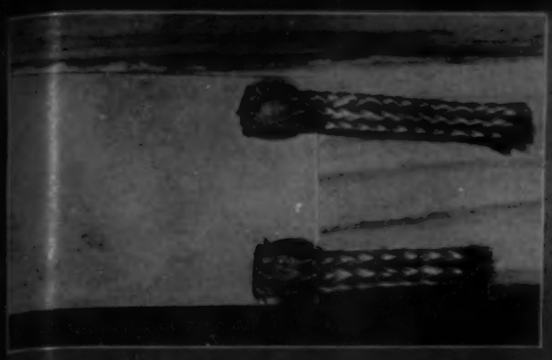
In the field of general flash welding, the number of the various devices fabricated by this means is almost too great to mention. Examples in this group are distinguished from those in the previous group by the fact that the parts to be welded are two separate and distinct pieces, *whereas the previous examples were concerned with the welding together of the two opposite ends of the same piece of material.*

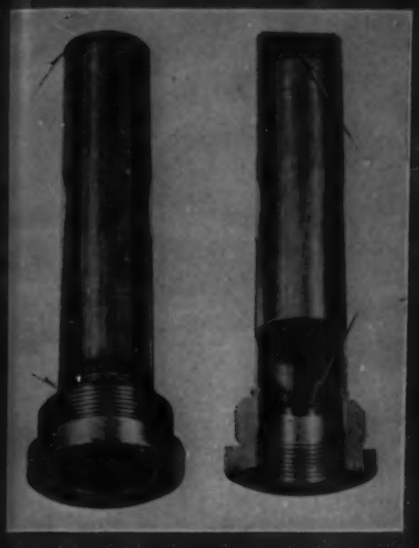
There are two fundamental results from utilization of flash welding which may, in a large measure, determine the importance of this process. First: Savings in strategic and critical materials, accomplished by welding smaller pieces of a material to larger pieces of a less critical material. Second: Use of this process to conserve manpower and equipment.

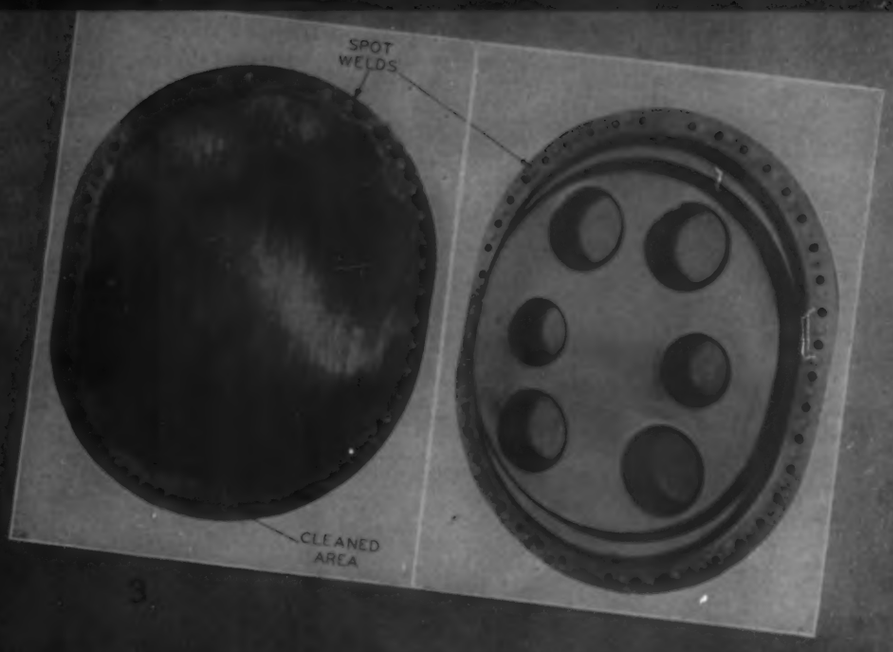
In the savings of strategic material, the flash welding of low-alloy drill shanks and drill extensions to ordinary and special twist drills—particularly highspeed drills—has accomplished savings of considerable consequence in the materials and in the cost of the fabricated assembly. Welding of high-heat resisting valve heads to the valve stems of internal combustion engines has likewise con-

(Please turn to Page 186)

Based on a paper presented before the Cleveland chapter, American Welding Society, May 8, 1942.







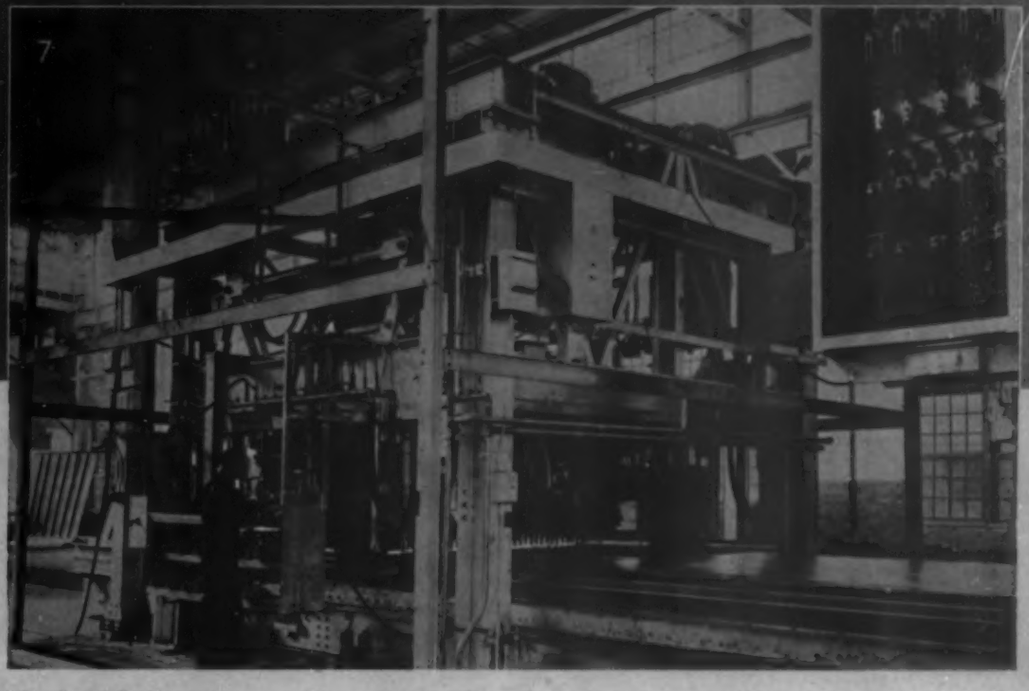


Fig. 1—This application of ring projection welding affords some idea of the savings that can be made in the fabrication of unusual parts. It would be extremely difficult to duplicate this small assembly by any other method at anywhere near the same cost. A 11/32-inch round is welded to 0.065-inch mild steel plate. Cross section of weld is 0.1 square inch; secondary current, 20,200 amperes; pressure, 625 pounds; time, 3 cycles; production, 1200 per hour

Fig. 2—Spot welding of tin-coated copper braid to cadmium plated steel is not a particularly easy welding job but is entirely feasible for production work. This job was developed to conserve tin by eliminating soldering and also to eliminate the severe breakage encountered in the flexible braids resulting from run-back of solder on the braid. Weld area, 0.07 square inch; secondary current, 23,000 amperes; pressure, 575 pounds; time, 6 cycles; production, 1000 units per hour—2000 welds per hour

Fig. 3—Front and rear view of aircraft subassembly where spot welding fastens together outside flat sheet and inner reinforcing sheet to form access door, bolted to main aircraft structure by mounting holes. All areas welded are cleaned to remove aluminum oxide, using a rotating wire brush. Other cleaning methods include use of steel wool, chemical dips and etches. Assembly shown was welded at machine speed of 80 spots per minute

Fig. 4—Part of machine-gun magazine fabricated entirely from sheet steel stampings by hot riveting and spot welding. Lugs on side of spiral guide inserted on inside wall of part extended through wall and are hot riveted by spot welding machine which heats lugs and flattens them—an unusual application of resistance welding that has important possibilities

Fig. 5—Stainless steel exhaust stack for aircraft engine is formed entirely from two stampings. The flanged edges are welded together. Junction between the two parts is spot welded

Fig. 6—Bomb burster casing shown was expensive to make before application of resistance welding and required a tremendous amount of machine shop facilities to produce the quantities desired. Now the design requires only a simple metal stamping for the top cap, a piece of resistance welded or seamless tubing for the body and a relatively simple screw machine part for the mounting cap

Fig. 7—This huge machine is a specially constructed multi-point spot welder. It produces a complete freight car side by making a large number of spot welds in rapid succession. Work travels underneath electrodes on carriage that enables the completed car side to be removed and a new one put in place while a third is being welded

Fig. 8—This large flash welder shows the size to which such resistance welding equipment is built. This unit is capable of welding a joint 96 inches long in material ¼-inch thick in a single quick operation. Upset metal is trimmed from the weld while in the machine which can be set up as part of a continuous production line. Weld can subsequently be rolled, formed or otherwise fabricated as an integral part of the material itself

Fig. 9—These specimens show the spot welding of medium size armor plate. Several processes have been developed for spot welding plate up to 1 inch in thickness, some work on even heavier plate. Most combine a forging action with the welding cycle

served strategic materials and has resulted in a valve assembly that is both better and cheaper than the previous assembly. This process had been developed and used to a limited extent before the present emergency but is now of much greater importance.

The welding of stainless steel to mild steel has enabled the designers of many war items to retain the advantages of the stainless steel in their design, with the use of only one-fourth to one-half of the stainless previously used.

Tank Armor Flash Welded: It is also possible to flash weld large sections of armor plate without the use of stainless steel welding rod and skilled operators. Ballistic tests on flash-welded armor indicate such a superior performance that a tank arsenal is now in the process of construction for the complete flash welding of tank hulls. The saving in time by this process, particularly in man-hours, is of considerable consequence on 1 and 1½-inch thick armor plate.

In Fig. 10 is shown a close-up view of the clamping dies for a machine used in flash welding the trailing edge of one sheet to the leading edge of the next from a 96-inch strip mill. Trimming cutters, shown in the retracted position, mill the edges of the sheets square with each other. After welding, the flash is trimmed in the machine and the sheet continues as an integral part of the strip.

Welding strip material end to end to produce a continuous strip permits the use of continuous processes without necessitating re-threading. See Fig. 8. In many cases it is not necessary to give any further consideration to the weld, and the welded portion goes through all of the subsequent processing operations as an integral part of the sheet or strip. This is true even though the subsequent operations may involve some rather deep-drawing.

Shortage of wide sheet and plate material has seriously threatened some large forming and stamping operations. By flash welding two or more smaller sheets or plates together it is possible to continue these processes with no increase in cost, because of the elimination of the higher premium charge for the larger widths.

Flash welding is widely used in joining simple parts to produce complicated assemblies. These may involve simple castings, forgings, stampings, or screw machine parts. The resulting savings in material and labor constitute a recognizable factor in speeding production. The parts themselves follow no standard pattern, and the variations and applications of the assemblies beggar description.

Spot and Seam Welding Used Extensively: In the more usual forms of resistance welding—spot, seam and projection—it is even more difficult to give a representa-

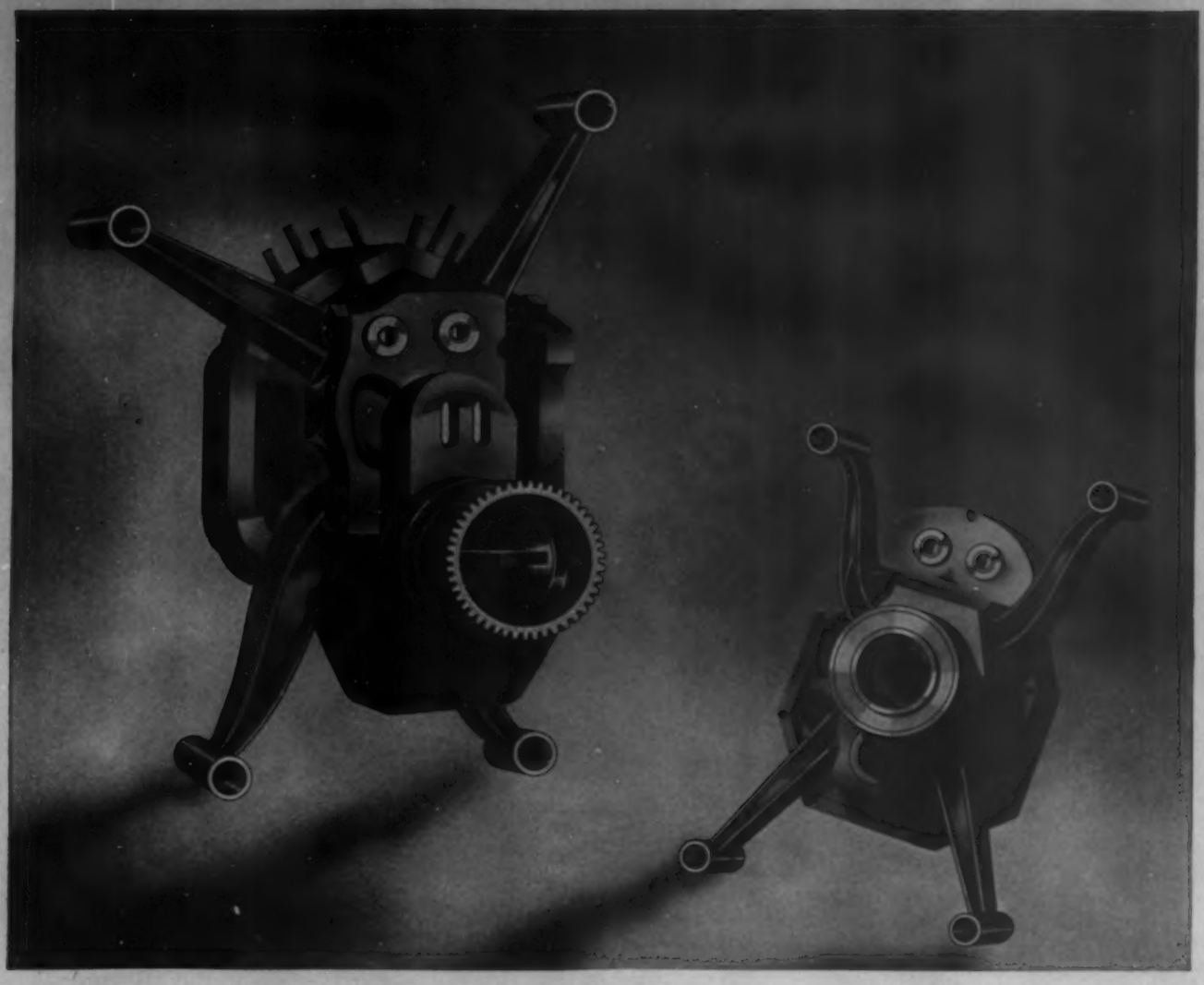


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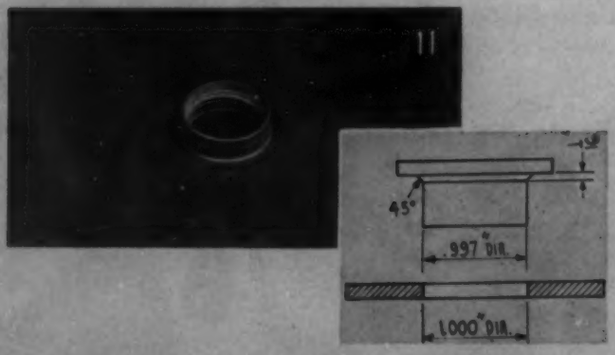
Fig. 10—Closeup of clamping dies on same large flash welder as shown in Fig. 8. The trimming cutters used to prepare the edge of the work square with one another for welding are shown in the retracted position

tive cross section of the war articles involved. To cover the war materials fabricated by the use of these methods would almost require a complete list of war *materiel*.

Both the Army and Navy were quick to recognize the value of these production tools before the advent of the war in Europe. Even at that early date resistance welding manufacturers were performing considerable experimental and research work in co-operation with the various branch of the armed services and in conjunction with the military commissions of the allies. This foresight on the part of the services can be recognized by the fact that resistance welding was incorporated in a large portion of the designs for armament from the outset of our war effort.

A few applications of spot, seam and projection welding will suffice to indicate the extent of utilization. Most of the following assemblies use at least two of these processes, many of them use all three and some include flash welding: Round bombs, anti-tank mines, parachute flares, chemical bombs, incendiary bombs, demolition bombs, trench mortar bombs, practice bombs and tailfin assemblies for almost all types of bombs.

Small bomb tail-fin assemblies shown in Fig. 12 are produced in large quantities on specially designed automatic welding machines. The two shown at the right have the tail fin spot welded to the base plug while the one on the left has the fins attached to the plug by projection welding. Of particular note is the fact that the projection-welded design produces a cleaner assembly.



Excessive heat marks are visible on the spot-welded assemblies, especially the center one.

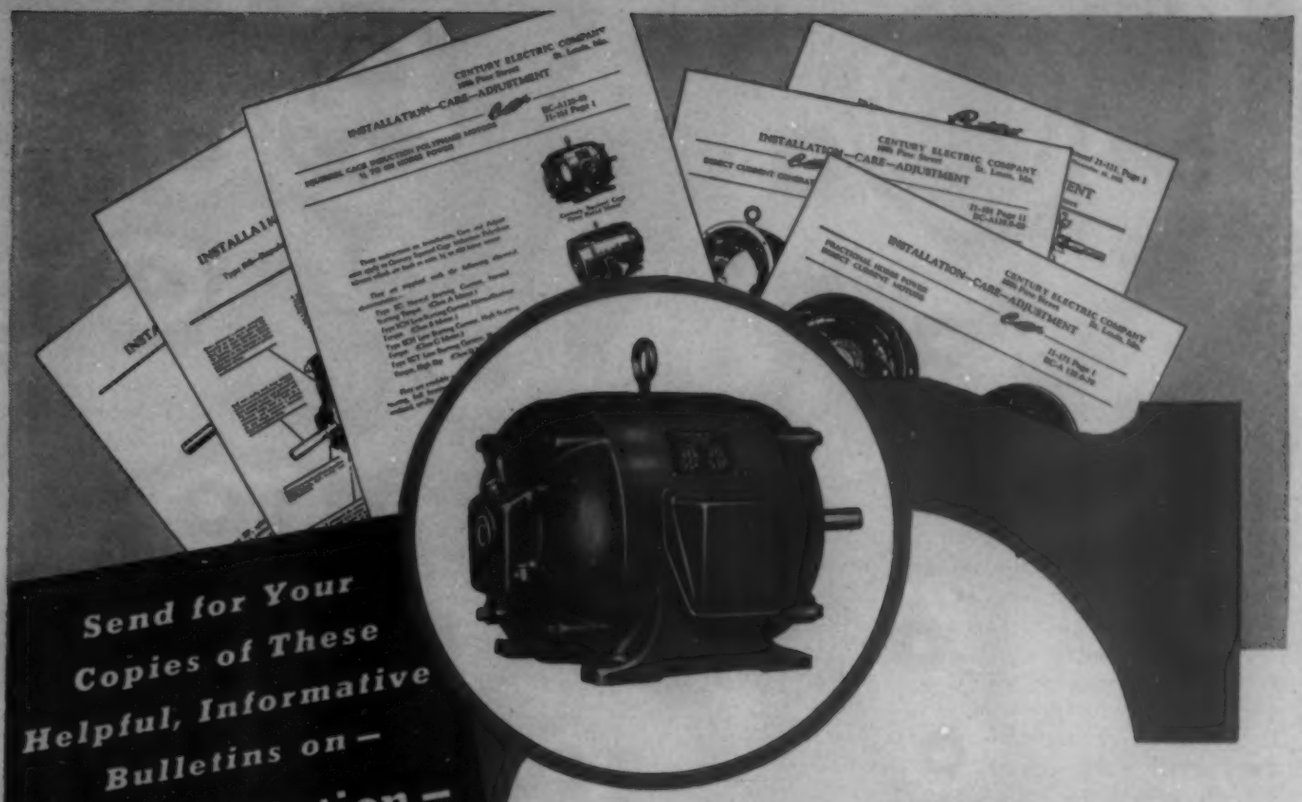
In Fig. 13 are larger units employing a somewhat different design. The fins are almost entirely sheet metal stampings and are in the major part spot welded together. The welding of the fins themselves to the base cap is accomplished by either spot or projection welds.

Another interesting application requiring high production and close tolerances involves a combination of hot riveting with spot welding and is illustrated in Fig. 4. This is a part of a machine gun magazine entirely fabricated from sheet steel stampings. In this case the spot-welding machine is utilized for performing the hot riveting operations.

Spot Weld Aircraft Assembly: As an indication of uses in aircraft a subassembly is shown in Fig. 3. Spot welding fastens an outside flat sheet to an inner reinforcing formed sheet. This particular unit is an access door which is bolted to the main structure by mounting holes. All welded areas had been cleaned prior to welding to remove aluminum oxide. In this particular assembly the oxide was removed with a rotating wire brush. Wire brushing, steel wool and chemical dips and etches are the prevailing methods for cleaning this type of alloy. The assembly shown was welded at a machine speed of approximately eighty spots per minute.

Seemingly insignificant is the application in Fig. 2.

Fig. 11—General method for installing bungs in barrels. Similar process is used to install spuds in hot water tanks and medium pressure vessels. Most so-called glass-lined tanks must have the pipe connection reinforcements welded in this manner to permit the porcelain enamel to flow over the welded region and completely seal the metal from action of the tank contents. Also this method is used to weld small lugs onto relatively thin gage material. Such lugs can be drilled and reamed after welding to receive a bushing for a small bearing



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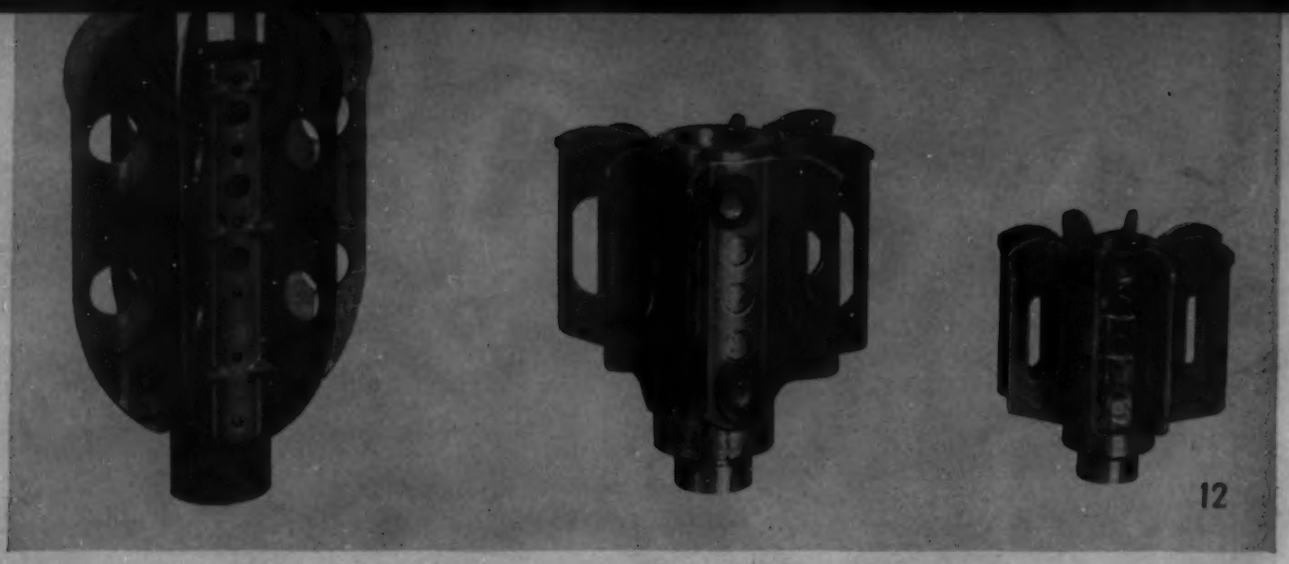

Fig. 12—Group of small bomb tail-fin assemblies produced in large quantities on specially designed automatic resistance welders. The two on right have tail fin spot welded onto the base plug. Assembly at left has fins attached to base plug by projection welding

Spot welding of the tin-coated copper braid, however, is not an easy job but is entirely feasible for production.

Welding of armor plate is usually considered difficult. Fig. 9 shows test specimens of successful spot welds.

Formed entirely from two stainless steel stampings is the aircraft engine exhaust stack in Fig. 5. The flanged edges are seam welded and the junction between the two ports is secured by spot welding.

Ring Projection is Useful: Ring projection welding has many useful applications such as shown in Figs. 1 and 11. Fig. 11 ilustrates the general method for installing bungs. A similar process is employed for spuds in medium pressure vessels. In fact, most of the porcelain-lined units must have pipe connection reinforcements welded in this manner to permit the flow of porcelain enamel over the welded region and completely seal the metal. Also, in this manner, small lugs are welded to relatively thin-gage material and are drilled and reamed after welding to support bushings for small bearings.

The insert in Fig. 11 is welded to 18-gage sheet steel and has 0.14-square-inch weld area. A current of 50,000 secondary amperes is required for the weld with 2500 pounds pressure; welding time, 33 cycles. Production is 750 per hour.

An idea of the savings that can be effected by ring-projection welding for the fabrication of unusual parts is indicated in Fig. 1. It would be difficulty to duplicate this small assembly by any other manufacturing method at anywhere near the same cost. The drawing of this part shows the method used to reduce the projection area. In this way the welding current used and the resulting strength of the joint are easily controlled. Round stock is welded to flat stock with a weld area of 0.1-square inch, requiring 20,200 secondary amperes and a pressure of 625 pounds.

Obviates Extensive Machining: Another utilization of projection welding is seen in Fig. 6. Previously, bomb burster casings were expensive to produce and required a tremendous amount of machine shop facilities to produce the quantities desired. This design, however, involves only a simple sheet metal stamping for the top cap, a piece of seamless steel tubing or resistance welded tubing for the body and a relatively simple screw machine part for the mounting cap. Of particular importance is the small sheet metal cap. To eliminate an expensive machining operation it is desirable to weld the cap with minimum distortion and flash from the weld itself. To accomplish this, a weld of short timing is required which in turn requires considerably more power to weld the small cap to the top of the tube than is required to weld the large screw machine part to the bottom of the tube.

Fig. 13—These bomb tail-fin assemblies are much larger than those in Fig. 12 and employ a different design. They consist almost entirely of sheet metal stampings, spot welded to-almost entirely of sheet metal stampings

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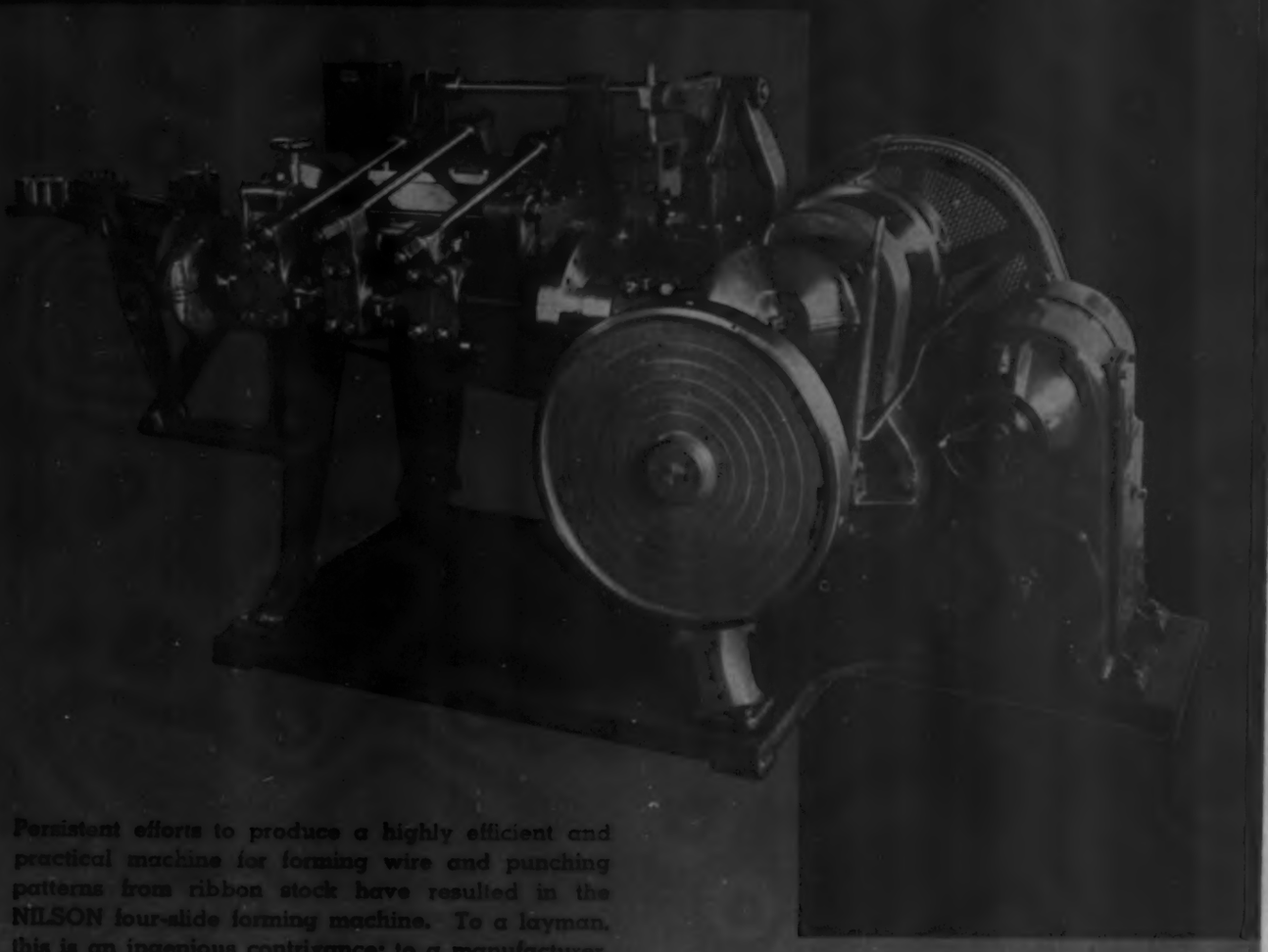

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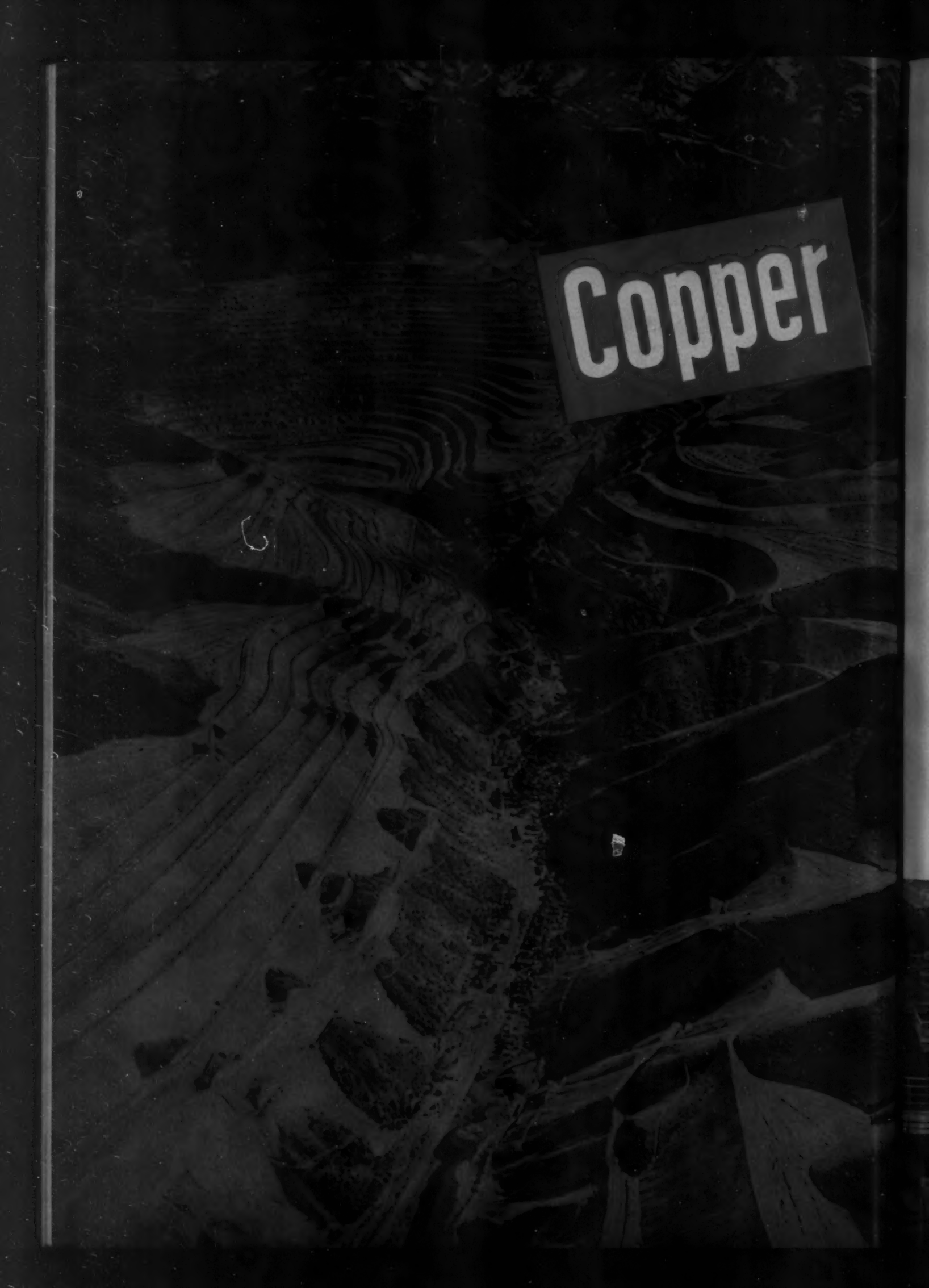
Copper

. . . . our sources of copper, supplies at hand and available, stockpiling, the world copper situation, production methods, conservation in ordnance work, substitution of steel for brass in cartridge cases, other important substitutions

(Section IV in a Series on Conservation and Substitution of Critical Materials in Ordnance Work)

By ARTHUR F. MACCONOCHIE
Head, Department of Mechanical Engineering
University of Virginia
University Station, Va.
And
Contributing Editor, STEEL

POSSIBLY no nonferrous metal among the many required for the manufacture of war equipment is of greater importance than copper. The readiness with which it alloys with other metals, particularly tin and zinc; the ease with which it can be drawn and pressed, whether in its native state or as an alloy; and the valuable physical properties it possesses, including its resistance to corrosion and its high conductivity for heat and electricity, render it invaluable for a wide variety of applications.

Perhaps the earliest metal to be used by man, it has woven itself into the fabric of human society for thousands of years. In the form of bronze, it has given its name to one of the great ages of mankind. Now in time of war it not only is an essential part of our shield and buckler but it also plays an important part in the spearhead of attack.

Any discussion of the proper allocation of available supplies should doubtless be prefaced by some account of nature and extent of our resources and the efforts which have been made and are even now in progress to extend them. To the layman, aware that nonessential use of the metal has virtually ceased and that large deposits of copper ores together with extensive mining and processing facilities exist within our borders, the knowledge that we are being forced to abandon brass cartridge manufacture and to conserve copper in many other ways which will be discussed comes as something of a shock, especially if he is familiar with our incomparably superior situation in relation to our enemies, particularly Germany, who has been able to maintain the world's greatest fighting machine in action over a period of three years.

By way of lending exact emphasis to these remarks, Fig. 7, taken from an excellent little book by Brooks Emeny entitled *The Strategy of Raw Materials* (to which I cordially recommend the reader), exhibits on the vertical scale the ratio between domestic production and apparent consumption of essential raw materials, including copper; and on the horizontal scale, the apparent consumption by countries expressed as a percentage of the largest national consumption—in this case, our own. This chart, of course, gives the peacetime situation of the great powers and takes no account of the absorption of unwilling vassals by the armies of conquering nations. Even so, Germany's situation has scarcely been improved as far as copper is concerned for it differs but little from the indications of the chart.

With a realism which has been absent from the approach of the United Nations until recently, and with a

Fig. 1. (Opposite page)—Utah Copper Co.'s open-cut copper mine at Bingham Canyon, Utah. Close examination will show town of Bingham in valley. From Mining & Metallurgy, *New York*

Fig. 2. (Left, below)—Battery of huge electric vibrating screens at Magna plant of Utah Copper Co. From Mining & Metallurgy, *New York*

Fig. 3. (Right)—Gold mining in northwestern states. In a world at war, gold is of little value. Gold mining operations should cease as the workmen are badly needed in the production of other metals such as copper. Federal Works Agency photo

Fig. 4—Flotation section, Utah Copper Co. plant, employs literally hundreds of electric motors on individual agitator drives. Flotation permits working ores containing only 1 per cent of copper. This has added many million tons to national ore reserves. From Mining & Metallurgy, *New York*

single-minded end in view, Germany first proceeded to develop her low-grade deposits, especially of iron and copper, building up her mineral production without regard to cost. Examples of this are the pig iron production of the Herman Goering Works at Salzgitter and the increased production of copper at the Mansfield mines, at a cost estimated to be more than double the world price. But this expansion has been worth every penny to the Nazis.

Further, since 1933, Germany has bartered with the Balkan states for most of their mineral output and has built up large stocks by imports from the Western hemisphere. At the same time, our mines, especially copper, were languishing in the depths of the depression of the thirties. Even now, in our anxieties over inflation and our political weakness which prevent the firm application of wage ceilings as well as price ceilings, men are leaving the copper mines to seek better paid work elsewhere. And gold mining, Fig. 3—a most useless effort at present—still continues to employ men who are badly needed in the copper mining industry.

The latest figures on copper production that can be published include February of this year. In that month, estimates indicate a total of 83,484 for domestic mines, including Alaska. This represented a decrease of 2733 short tons from that of January, but since February is a short month, the actual daily production rose from 2781 to 2982. The overall picture of copper production from domestic ores as reported by smelters during recent years may best be seen in the following table:

	Short Tons
1941	979,500
1940	909,084
1939	712,675
1938	562,328
1937	834,661
1934	232,522
1931	524,552
1928	934,496

If our January production rate be maintained throughout this year, production will top *a million tons.* Coupled with this, at the end of 1941 we had on hand 77,500 tons of refined copper and 239,500 tons of blister and materials in solution. From these figures some idea of the extent of our own needs, together with lend-lease commitments, can be gained if we remember that brass cartridge cases—the largest single use—must be abandoned.

During the years 1932 to 1938 German imports of copper metal rose from 152,200 short tons to over 300,000: and her imports of copper ore from 262,000 to 720,000 tons. Unhampered by the democratic philosophy of holding the carrot in front of the donkey, Germany applied the stick in the shape of government control of all labor unions, whose members as early as 1936 were obliged to work 60 hours a week, any who resisted being sent to a concentration camp. Milder forms of obstruction, of the ca' canny variety, were controlled through reduction in food rations allowed the workman and his family.

This is not intended as an incitement toward the adoption of totalitarian methods since the right of free men to work where, as, and if they please is something we hope to preserve. However, it may well be questioned whether the compromise policy of establishing a 12-cent ceiling for electrolytic copper and 17 cents for

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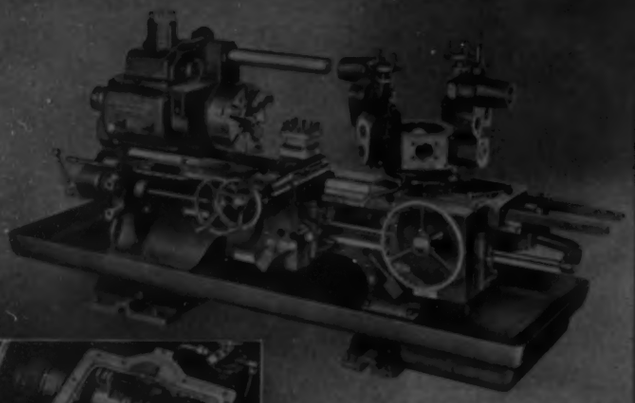

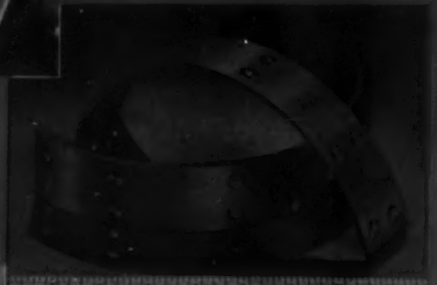

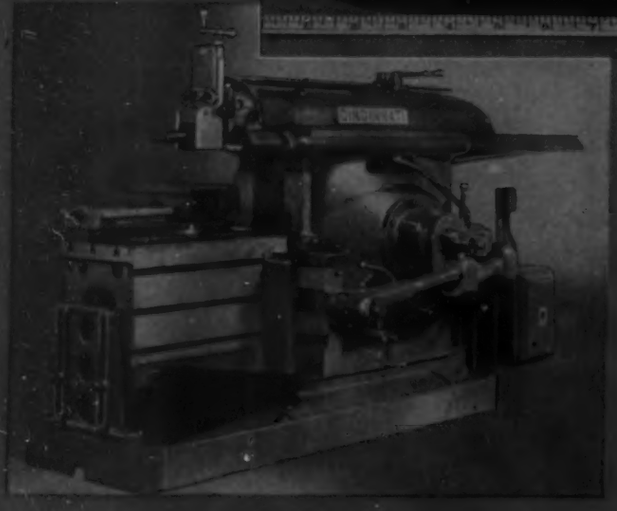

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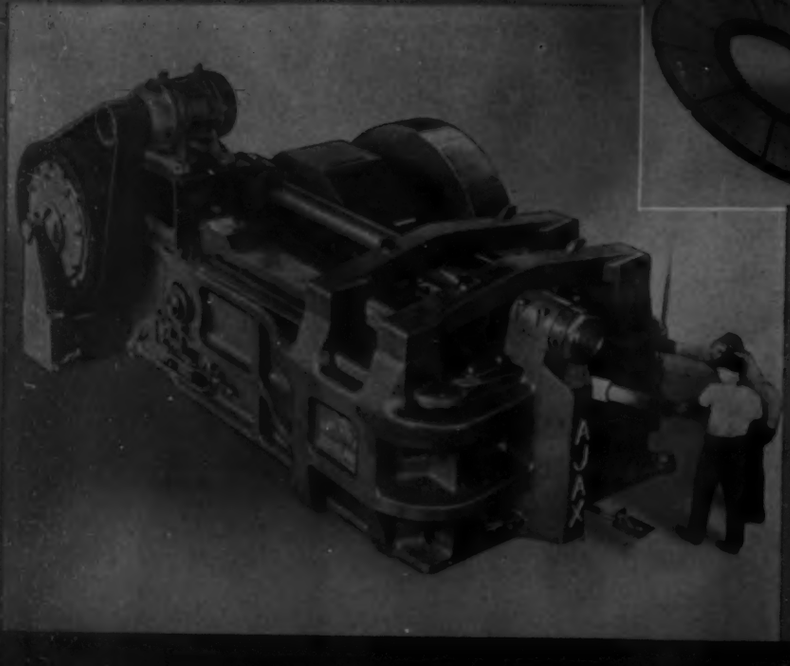
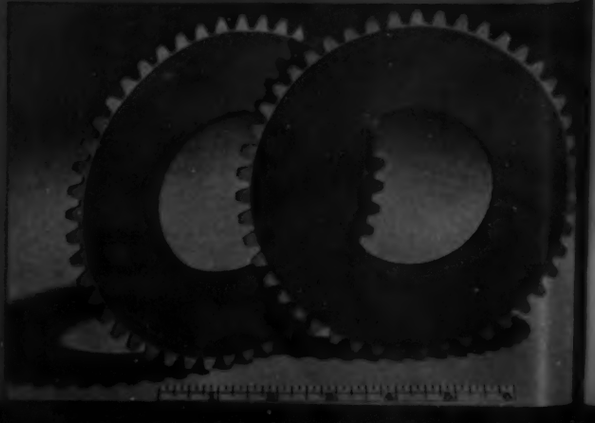




See Us at Booth E-142 at The Metal Show

Fig. 5—Some idea of the size of this huge 200-foot diameter thickener tank for de-watering flotation tailings at Miami, Ariz., can be had by looking for the men standing at the center and at the far right rim. Bureau of Mines, Department of Interior photo

over-quota output will produce as much copper from a boomer industry as we might get if economic forces were allowed a little more free play.

By way of contrast with the effective policy of our enemies, the principle of stockpiling, *considered by the War Department since* 1927, was only established by our government during the fiscal year 1937-1938, in which Congress allotted a small sum for the purchase of strategic materials to be stored for emergency use by the Navy. The Strategic Minerals act, which became law in June, 1939, finally established a sound basis for action. This bill authorized the expenditure of $100,000,000 over a period of four years for stockpiling purposes and in addition provided funds for an investigation of domestic resources of strategic minerals and for developing methods of treatment for low and off-grade ores.

Later, the money available for the purchase of strategic materials was increased by the creation of the Metals Reserve Co., an organization with $5,000,000 capital, to which the Reconstruction Finance Corp. authorized loans of an additional $100,000,000 for the purchase of tin, manganese and other metals; but there is no reference to copper from domestic sources.

When it became apparent, in the last quarter of 1940, that production in the United States was insufficient to meet the demands of industry, the Metals Reserve Co. began making arrangements to buy Latin American copper. Receipts were to form a buffer stock pile, and manufacturers who were unable to obtain their copper requirements from domestic refiners were to be permitted to draw from government stocks. Deliveries from the stock pile to domestic consumers were begun in March, 1941.

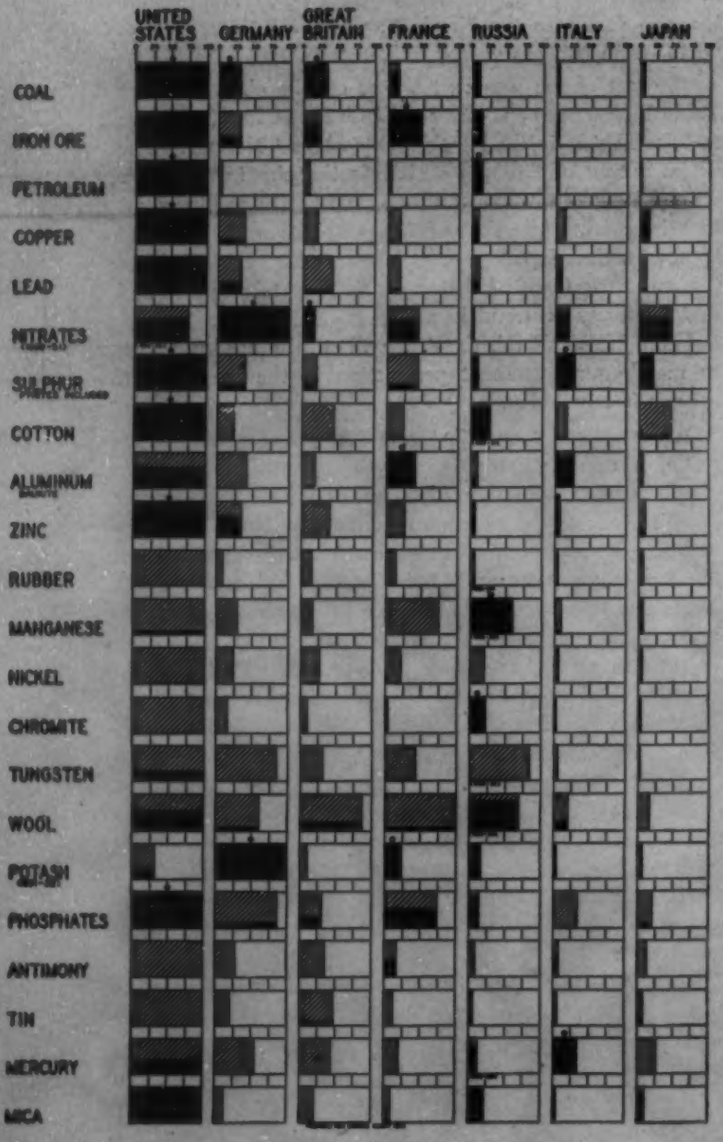
Before turning from this statistical stocktaking of our resources to a discussion of the contributions of the United States Geological Survey and the Bureau of Mines toward their expansion, a glance at the world copper situation as it existed in the early stages of the present war in Europe and immediately preceding its outbreak gives some comfort. Coupled with our million-ton volume in prospect for this year, Canada had expanded her 1939 output of close to a quarter of a million tons by 14 per cent in 1940 to well over a third of a million tons. While no information is available concerning prospects for 1942, it may be assumed that forward steps have been taken in both 1941 and 1942. If we add up our own estimated production for this year and those of Canada, Cuba and Mexico, the gross for the North American continent cannot be far from *one and a half million tons.*

The rest of the world's total, as can be observed from Table I (*Bureau of Mines Yearbook* for 1940) (see page 204) is largely in the hands of the United Nations. The entire output of Europe, excluding the U.S.S.R. and the United Kingdom, was just over a quarter of a million short tons in 1938, while that of Asia—or rather that part of it now under Japanese control—was less than half of this amount. Granted that expansion has taken place and that Germany acquired large stocks of copper in France, Belgium and Holland, the Axis will still be hard put to it to match our armament production in the long pull if copper is any index.

While copper occurs in the native state and also as an oxide, a carbonate and a silicate, most of the world's copper comes from the sulphides, of which chalcopyrite ($CuFeS_2$) is the most common; and, in North America at least, the most important commercially. When pure it has a copper content of 34.5 per cent. Chalcocite (Cu_2S) is second to chalcopyrite and up to about 30 years ago was the source of more than half the copper produced. It has a much higher copper content—some 79.8 per cent—when in the pure state. Bornite, another copper-iron sulphide with about 55.6 per cent copper, is important in a few districts; while enargite ($3Cu_2SAs_2S_5$), with 48.3 per cent copper, is one of the important ore minerals at Butte, Mont. Malachite (a carbonate) and chrysocolla (a silicate) are mined in the oxidized zones of copper deposits and are the principal sources of copper at the Inspiration and Miami mines. Native copper is the only copper mineral mined in the Lake Superior district of Michigan.

As a characteristic illustration of open-cut mining operations, Fig. 1 is a view of the Utah Copper Co.'s open-cut mine at Bingham Canyon, Utah. Note the tiny

Fig. 6—While the problem of substituting steel for brass as a material for cartridge cases has been solved for artillery ammunition, small arms cartridge cases are still made of brass. However, since the largest tonnage of brass is in artillery cases, that change has already made important savings



buildings that represent the town of Bingham at the bottom of the valley—almost lost in the huge expanse. The Utah copper ore body has an overall length on its long axis of about 6000 feet, a maximum width of 4000 feet and a vertical depth of around 2000 feet. An average of some 115 feet of capping or completely leached porphyry originally covered the ore; but by the end of 1934 about 121,000,000 cubic yards had been removed. This is one of the largest reserves of developed ore in the country.

The invention of flotation is one of the most important developments in metal mining for it makes practicable the working of extremely low-grade ores. Not long ago 2 per cent ore had no value. Today some of the most profitable mines work ores of 1 to 1.3 per cent. In 1930, over 44 per cent of copper output came from deposits considered worthless in 1900.

In concentration by flotation, the ore is ground wet to the desired degree of fineness, a certain amount of conditioning, frothing, depressing and collecting reagent added and the mixture violently stirred. Air is introduced by agitators or by forcing it into the mixture under pressure, forming vast numbers of air bubbles to which the water-repellent ore-mineral particles attach themselves to be carried to the surface by reason of their enhanced buoyancy.

Meanwhile, the particles of gangue, which are readily wetted by water, do not collect air bubbles and so remain at lower levels. In this way a separation of ore-mineral

Fig. 7—Situation of the "great powers" reveals extent of national self-sufficiency in essential raw materials in terms of comparative consumption demand. Vertical scale: Domestic production and net imports, expressed as percentages of apparent consumption of product indicated with black section indicating domestic production, shaded area denoting net imports. Horizontal scale: Apparent consumption of product indicated expressed as percentage of the largest annual national consumption. The black dot over a section indicates net exports were larger than 2 per cent of total apparent consumption of the seven powers. Unless otherwise noted, percentages are yearly averages for 1925-29 inclusive, except Russia 1929-32. From Brooks Emeny's The Strategy of Raw Materials *published by Macmillan Co.*

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This is a *must* . . . the urgent problem is more and still MORE scrap iron. Steel plants need MORE—because manufacturing plants need MORE steel—because the armed forces need MORE weapons to speed Axis surrender. ¶The situation is critical, the time is now. It calls for America's top resourcefulness, energy and executive skill. It takes cooperation from every industrial worker, every industrial plant, every civilian. ¶Your nearest salvage collector will buy your scrap iron and move it to the steel mills. Every pound will help secure the homes, lives, and future of all of us. Every pound will bring the Nazi-Nippon "Kamerad" nearer!

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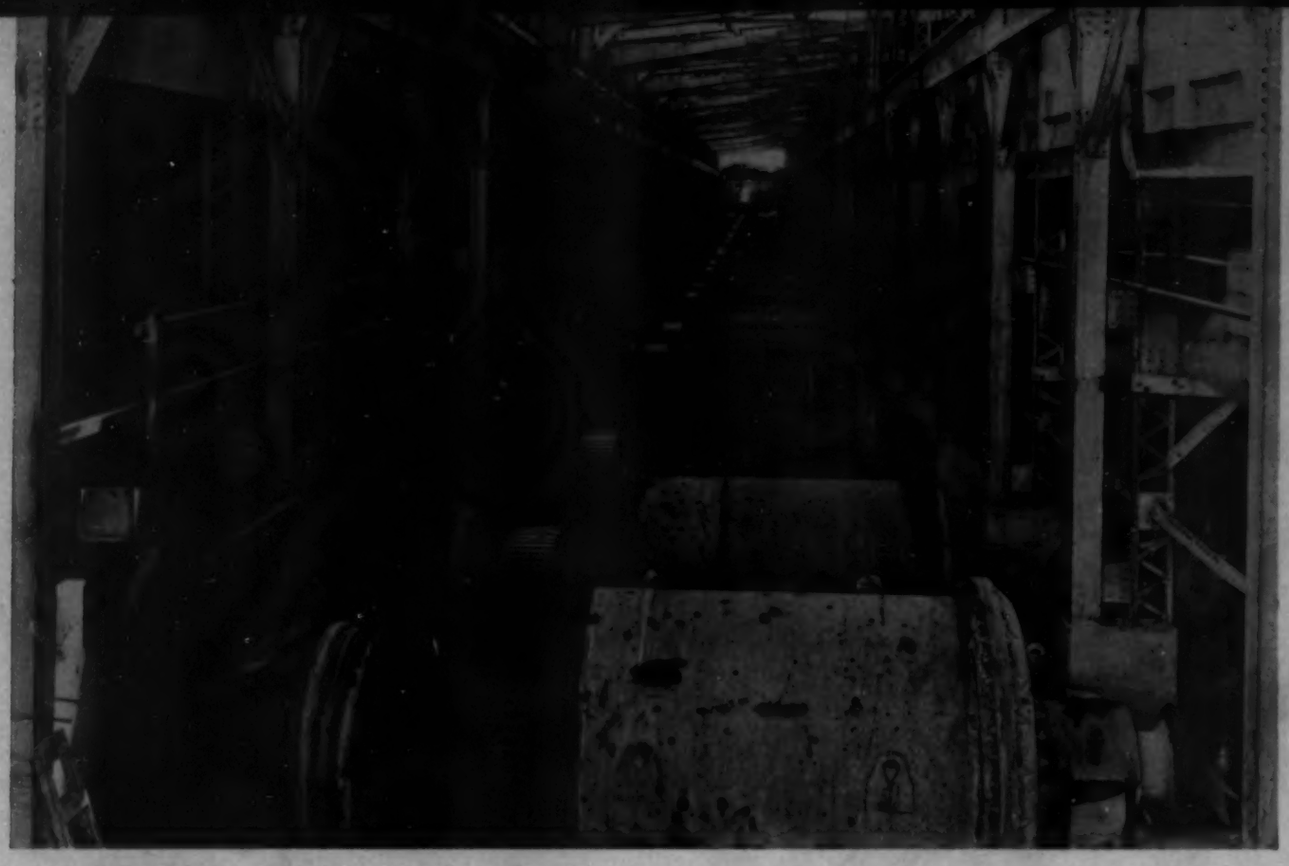

Fig. 8—Ball mill section, Utah Copper Co. plant. From Mining & Metallurgy, *New York*

and gangue particles is made, the efficiency of the operation depending both on the character of the ore and the effectiveness of the action. A typical flotation section at Utah Copper Co. plant is shown in Fig. 4. Note that literally hundreds of vertical electric motors are used on individual agitator drives.

In the extraction of copper from its various ores, two methods are in general use. The first, known as the dry method, involves smelting in a reverberatory furnace, followed by the bessemerizing of the copper matte in a converter. The second consists of a leaching process (with or without a preliminary roast) and subsequent precipitation of the copper from solution. The reason for roasting copper ores arises from the greater affinity of copper for sulphur than any of the other familiar metals. Thus when copper ore containing sulphur is fused, Cu_2S is formed. Any excess sulphur forms sulphides of other metals, known as matte. If the sulphur is too high, the losses of copper in the waste slag increase. Roasting thus helps remove the undesired sulphur.

The blister copper from the converter is porous and brittle and must be refined to get rid of impurities, irons, etc., and to recover any precious metals that may be present in quantity. Since the latter is generally the case, the electrolytic method of refining has superseded the older process of fire refining in which a reverberatory type furnace was used and the cuprous oxide reduced by "poling" or forcing poles of green timber, butt end first, into the mass of molten copper.

Mention has already been made of the highly successful results attending our efforts to use steel for cartridge cases, successful firings having now been conducted in four calibers of artillery ammunition. A major problem was successful obturation (contraction of the case after firing to permit extraction from the gun), but this appears to have been satisfactorily overcome.

Another is the loss of shape after the first firing, necessitating re-shaping if the case is to be used again. Brass artillery cartridge cases have been used as many as eight times before finally relegating them to the scrap pile, thus conserving production capacity.

Then there is the matter of corrosion of steel cartridge cases, both external and internal—a problem which has been successfully solved. Savings of copper by use of steel in artillery ammunition alone will reach 30,500 tons this year and 295,500 tons in 1943—no insignificant proportion of our total output.

The use of steel for cartridge cases for small arms ammunition—especially 0.30 and 0.50-caliber—has not yet progressed to a stage where any definite statements regarding its successful application can be made. Experimental work gives much promise of our ability to manufacture on existing production lines. It should be pointed out that while the total number of small arms ammunition rounds required is of considerable proportions, the weight of each individual cartridge case is small.

The copper alloy band surrounding the shell body or projectile near the base functions as a gas check and imparts rotary motion to the projectile by engaging the rifling grooves of the gun as it is fired. This band has also been the subject of study. Several projects now under way are aimed at reducing the amount of copper required. These include the use of powdered metals such as copper itself, gilding metal, soft steel and also copper bands formed by electrodeposition.

A serious drawback to some of these proposals lies in the coppering of the barrel caused by using pure copper instead of gilding metal. Perhaps powdered copper alloys are the most hopeful, embrittlement tests at low temperatures being under way.

Boosters and primers for artillery ammunition are among the smaller items in which copper can be saved.

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Fig. 9—These fuze parts for trench mortar shell are now made from plastics to save critical materials, especially copper. Many similar substitutions are being made in other important ordnance items. In none, however, is quality permitted to be sacrificed—the substitute must serve equally as well or better than the original material

Most booster parts can be produced from other materials on the same machines that now make the brass parts; but primers of aluminum, copper and steel have slightly different weights from the present standards and have an appreciable effect on ballistics.

No repercussions, however, appear to have resulted from the use of steel bullet jackets, clad outside and in with gilding metal. This procedure saves about 80 per cent of the gilding metal—or rather would save this amount if the scrap losses were not higher than with cupro-nickel envelopes. At present, the saving in gilding metal is only about 60 per cent, but it will take us some considerable time to change over.

Copper-plated steel jackets are proving effective for 0.45-caliber ammunition apparently, but possibly trouble may occur from coppering of the barrel in this case also.

The complexity of the conservation problem is well illustrated by the fact that while we use our utmost endeavors to limit use of copper in the ways indicated above and in a wide variety of other items, including parts of combat vehicles and artillery material, the demand for copper in steel castings is rising because of its substitution for nickel, which is more critical. Then, too, the high coefficient of heat transmission of copper and its alloys, particularly cupro-nickel, renders substitution difficult in such assemblies as oil cooler systems.

However, good results have been obtained in the substitution of bearing materials other than bronze. For instance, the central bronze hemisphere bearing of a certain type of anti-aircraft gun is being made successfully from a copper-molybdenum cast iron.

So we might proceed, citing illustration after illustration of gray or cast iron substituted for bronze in fuse-setters; lead-base antimonial metal for bronze name plates; bronze-faced glands instead of solid bronze; and compression rings with bronze only where they fit.

The suggestion has been made that we are possibly piling up too much war material; but being in the defensive we are obliged to accumulate stocks over a vast area of the earth's surface. Further, as compared with Germany, who is able to salvage much material as she advances, and to add captured supplies, we must make good the losses of the United Nations, especially Russia.

Whereas in Germany and the occupied countries civilian use is down to the bone, we are still getting as much copper for civilian use as in the days of the depression—but the indications are that we shall get less and less.

◆

TABLE I—World Mine and Smelter Production of Copper from 1938 to 1940 in Metric Tons

Country	Mine			Smelter		
	1938	1939	1940	1938	1939	1940
North America:						
Canada	259,113	275,820	(1)	[2] 215,732	[2] 229,370	(1)
Cuba	14,431	9,964	10,500			
Mexico	41,851	44,390	37,602	37,100	44,300	34,400
Newfoundland	8,056	10,341	9,426			
United States	505,991	660,717	796,582	[3] 570,773	[3] 698,323	[3] 922,369
	829,442	1,001,241	(1)	823,605	971,993	(1)
South America:						
Bolivia	[4] 2,885	[4] 4,056	[4] 6,600			
Brazil	15	14	(1)			
Chile	351,443	339,170	352,439	337,508	324,591	337,021
Peru	37,529	38,170	37,686	35,741	34,115	33,584
	391,872	381,410	397,000	373,249	358,706	370,605
Europe:						
Belgium				[5] 81,460	(1)	(1)
Bulgaria	64	320	(1)			
Finland	12,232	11,707	(1)	11,824	13,240	(1)
France	[6] 600	(1)	(1)	(1)	(1)	(1)
Germany	30,000	30,000	(1)	[7] 70,000	[7] 66,000	(1)
Austria						
Hungary	336	(1)	(1)			
Italy	[6] 1,000	(1)	(1)	2,963	(1)	(1)
Norway	21,619	19,436	(1)	10,547	10,515	(1)
Portugal	4,884	(1)	(1)			
Rumania	[6] 380	(1)	(1)	580	(1)	(1)
Spain	[6] 30,000	(1)	(1)	[6] 11,000	[6] 7,300	(1)
Sweden	9,299	9,610	(1)	10,668	11,076	(1)
U. S. S. R.	[10] 114,552	[10] 144,000	(1)	114,552	144,000	(1)
United Kingdom	37	(1)	(1)	7,200	(1)	(1)
Yugoslavia	40,500	64,200	(1)	41,993	41,658	42,951
	275,000	(1)	(1)	363,000	(1)	(1)
Asia:						
Burma	[6] 3,600	(1)	(1)			
China [11]	240	1	(11)	240	1	(11)
Cyprus	29,780	24,384	(1)			
India, British	[6] 5,600	(1)	(1)	5,410	6,800	(1)
Japan:						
Japan Proper	[10] 102,000	[10] 104,000	(1)	102,000	104,000	(1)
Taiwan	[6] 4,000	[6] 4,000	[6] 4,000			
Netherlands Indies	93	94	(1)			
Philippine Islands	3,528	7,496	9,259			
Turkey	[10] 2,488	[10] 5,917	(1)	2,488	5,917	(1)
U. S. S. R.	(9)	(9)	(9)	(9)	(9)	(9)
	[9] 151,000	(1)	(1)	[9] 110,144	[9] 116,718	(1)
Africa:						
Algeria	22	(1)	(1)			
Belgian Congo	[10] 122,943	[10] 122,649	(1)	122,943	122,649	(1)
Rhodesia:						
Northern	254,904	(1)	(1)	216,450	215,065	(1)
Southern	5	(1)	(1)			
South-West Africa	4,828	3,530	1,485			
Union of South Africa	11,305	10,998	(1)	13,468	14,089	(1)
	393,007	(1)	(1)	353,861	351,803	(1)
Oceania: Australia	19,758	19,800	(1)	17,372	20,219	(1)
	2,062,000	(1)	(1)	2,041,000	[12] 2,216,000	(1)

[1] Data not available.
[2] Copper content of blister produced.
[3] Smelter output from domestic and foreign ores, exclusive of scrap. The production from domestic ores only, exclusive of scrap, was as follows: 1938, 510,133 tons; 1939, 646,534 tons; 1940, 824,703 tons.
[4] Copper content of exports.
[5] Figures represent blister copper only. In addition to blister copper, Belgium reports a large output of refined copper which is not included above as it is believed produced principally from crude copper from the Belgian Congo and would therefore duplicate output reported under the latter country.
[6] Approximate production.
[7] Exclusive of material from scrap.
[8] Smelter output from ores.
[9] Output from U. S. S. R. in Asia included under U. S. S. R. in Europe.
[10] Smelter product.
[11] Exports of ingots and slabs.
[12] Less than 1 ton.
[13] Approximate production based upon output of countries shown, which in 1938 contributed about 95 percent of total world output.

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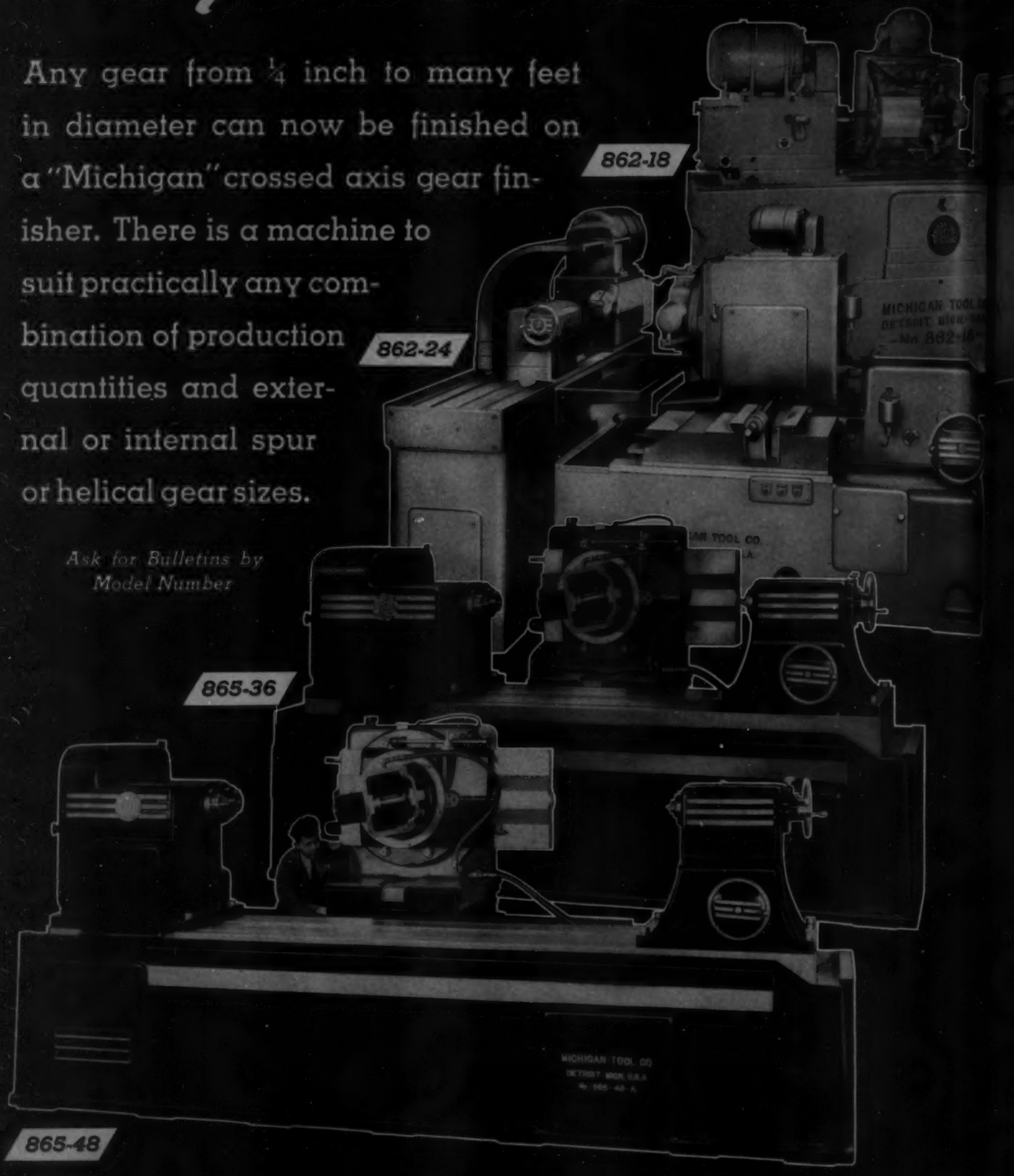

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900 (Rack Type)	1" to 8"
860-(A or B)-8	1" to 8"
860-(A or B)-12	1" to 12"
860-(A or B)-16	1" to 16"
862-18 (Heavy Duty)	2¼" to 18"
862-24 (Heavy Duty)	2¼" to 24"
865-36 (Heavy Duty)	4" to 36"
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WAR PRODUCTION GROUP MEETINGS

. . . . on war production problems, conservation and substitution, sponsored by American Society for Metals and held in conjunction with the 1942 National Metal Congress and Exposition at Public Hall, Cleveland, Oct. 12 to 16, inclusive

Monday, Oct. 12

2:00 P.M.

"Metallurgical Aspects of the National Emergency Steels"
"Aluminum"

4:00 P.M.

"Employe Training in Metalworking Departments"

8:00 P.M.

"Doing More with What Alloys We Have by Using National Emergency Steels"
"Manufacture and Heat Treatment of Magnesium Castings"
"Salvage of Broken Tools and Maintenance of Equipment"

Tuesday, Oct. 13

2:00 P.M.

"Doing More with Available Tool Steels"
"Speeding Production by Improved Metal Cutting Practice (Part I)"

4:00 P.M.

"Interpretation of Magnaflux and Other Surface Inspection Tests"

8:00 P.M.

"Selecting the Proper Die Steels for Mass Production"
"Use and Interpretation of Radiography As an Inspection Method"
"Speeding Production by Improved Metal Cutting Practice (Part II)"

Wednesday, Oct. 14

2:00 P.M.

"Making More Steel in Open-Hearth Plants"
"Problems Associated with the Large Expansion of the Steel Foundry Industry"

4:00 P.M.

"Use of Powdered Metals in War Production and Tools"

Bradley Stoughton

President, American Society for Metals; Dean of Engineering, Lehigh university, Bethlehem, Pa.

8:00 P.M.

"Increasing Yields of Electric Furnaces (Electric Steel Manufacture)"
"Doing More with Low-Alloy and Carbon Steels by Use of Special Additions in Steel Manufacture (Intensifiers)"
"Recruiting, Training and Handling Inspectors of Metallurgical Material"

Thursday, Oct. 15

2:00 P.M.

"Speeding the Job by Better Production Heating for Softening"
"Better Use of Secondary Metals"

4:00 P.M.

"Programs for Segregation, Collection and Reclamation of Metal Scrap"

7:00 P.M.—HOTEL STATLER BALLROOM

Annual Banquet of the American Society for Metals

Friday, Oct. 16

2:00 P.M.

"Speeding the Job by Better and Faster Production Hardening"
"Getting By with Low-Tin Alloys"

4:00 P.M.

"Methods and Materials for Surface Protection"

ASM TECHNICAL PROGRAM

Headquarters—Hotel Statler

Monday, Oct. 12

9:30 A.M.—Lattice Room

"Effect of Elements in Solid Solution on Hardness and Response to Heat Treatment of Iron Binary Alloys", by C. R. Austin, Pennsylvania State college, State College, Pa.

"Third Element Effects on Hardenability of a Pure Hyper-Eutectoid Iron-Carbon Alloy", by C. R. Austin and T. A. Prater, Pennsylvania State college, State College, Pa., and W. G. Van Note, North Carolina State college, Raleigh, N. C.

"The Ar^3 Range in Some Iron-Cobalt-Tungsten Alloys", by W. P. Sykes, General Electric Co., Schenectady, N. Y.

9:30 A.M.—Parlors 1, 2 and 3

"The Effect of Hardness on the Machinability of Six Alloy Steels", by O. W. Boston and L. V. Colwell, University of Michigan, Ann Arbor, Mich.

"Carburizing Characteristics of 0.20 Per Cent Carbon Alloy and Plain Carbon Steels", by G. K. Manning, Republic Steel Corp., Cleveland.

"The Metallography of Galvanized Sheet Steel Using a Specially Prepared Polishing Medium with Controlled pH", by D. H. Rowland and O. E. Romig, Carnegie-Illinois Steel Corp., Pittsburgh.

9:30 A.M.—Grand Ballroom

"Bursting Tests on Notched Alloy Steel Tubing", by G. Sachs and J. D. Lubahn, Case School of Applied Science, Cleveland.

"Notched Bar Tensile Tests on Heat Treated Low Alloy Steels", by G. Sachs and J. D. Lubahn, Case School of Applied Science, Cleveland.

"Stress-Strain Measurements in the Drawing of Cylindrical Cups", by E. L. Bartholomew Jr., Massachusetts Institute of Technology, Cambridge, Mass.

"Fatigue Strength of Normalized and Tempered Versus As-Forged Full Size Railroad Car Axles", by O. J. Horger and T. V. Buckwalter, Timken Roller Bearing Co., Canton, O.

5:00 P.M.—Public Auditorium

Educational Course

"Tool Steels", by J. P. Gill, Vanadium-Alloys Steel Co., Latrobe, Pa.

Tuesday, Oct. 13

9:30 A.M.—Lattice Room

"The End-Quench Test: Reproducibility", by Morse Hill, Wright Field, Dayton, O.

"The End-Quench Test: Hardenability of Aircraft Steels and Its Representation", by Morse Hill, Wright Field, Dayton, O.

"Hardenability Control of a One Per Cent Carbon Steel", by G. R. Barrow and Gilbert Soler, Timken Roller Bearing Co., Canton, O.

9:30 A.M.—Grand Ballroom

"The Alpha Iron Lattice Parameter as Affected by Molybdenum, and an Introduction to the Problem of the Partition of Molybdenum in Steel", by F. E. Bowman, R. M. Parke and A. J. Herzig, Climax Molybdenum Co., New York.

"The Effect of Molybdenum on the Isothermal, Subcritical Transformation of Austenite in Eutectoid and Hyper-Eutectoid Steels", by J. R. Blanchard, R. M. Parke and A. J. Herzig, Climax Molybdenum Co., New York.

"The Effect of Molybdenum on the Rate of Diffusion of Carbon in Austenite", by J. L. Ham, R. M. Parke and A. J. Herzig, Climax Molybdenum Co., New York.

John Chipman

Edward De Mille Campbell Memorial Lecturer for 1942; Massachusetts Institute of Technology, Cambridge, Mass.

9:30 A.M.—Parlors 1, 2 and 3

"The Method of Thin Films for the Study of Intermetallic Diffusion and Chemical Reactions at Metallic Surfaces", by H. S. Coleman and H. L. Yeagley, Pennsylvania State college, State College, Pa.

"On the Location of Flaws by Stereo-Radiography", by James Rigbey, Ford Motor Co. of Canada, Windsor, Ont.

"The Fluorescent Penetrant Method of Detecting Discontinuities", by Taber de Forest, Magnaflux Corp., Chicago.

5:00 P.M.—Public Auditorium

Educational Course

"Tool Steels", by J. P. Gill, Vanadium-Alloys Steel Co., Latrobe, Pa.

Wednesday, Oct. 14

9:00 A.M. Grand Ballroom

Business Meeting

1942 Edward De Mille Campbell Memorial Lecture, by John Chipman, Massachusetts Institute of Technology, Cambridge, Mass.

5:00 P.M.—Public Auditorium

Educational Course

"Tool Steels", by J. P. Gill, Vanadium-Alloys Steel Co., Latrobe, Pa.

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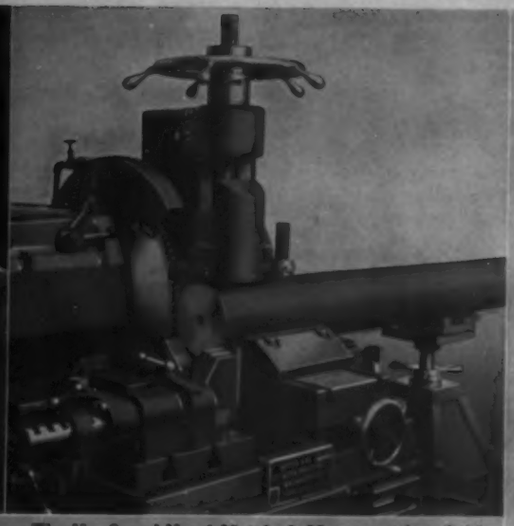

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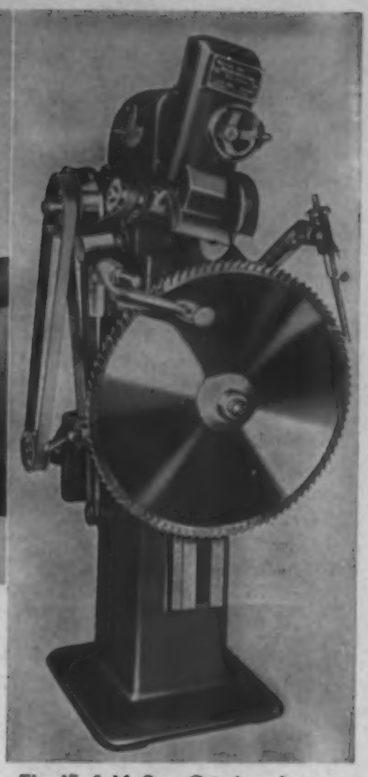

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Thursday, Oct. 15

9:30 A.M.—Grand Ballroom

"A Metallographic Study of the Formation of Austenite from Aggregates of Ferrite and Cementite in an Iron-Carbon Alloy of 0.5 Per Cent Carbon", by T. G. Digges and S. J. Rosenberg, National Bureau of Standards, Washington.

"Influence of Initial Structure and Rate of Heating on the Austenitic Grain Size of 0.5 Per Cent Carbon Steels and Iron-Carbon Alloy", by T. G. Digges and S. J. Rosenberg, National Bureau of Standards, Washington.

"The Mechanism and the Rate of Formation of Austenite from Ferrite-Cementite Aggregates", by G. A. Roberts, Vanadium-Alloys Steel Co., Latrobe, Pa., and R. F. Mehl, Carnegie Institute of Technology, Pittsburgh.

9:30 A.M.—Parlors 1, 2 and 3

"The Tantalum-Carbon System", by F. H. Ellinger, General Electric Co., Schenectady, N. Y.

"Influence of Strain Rate on Strength and Type of Failure of Carbon-Molybdenum Steel at 850, 1000 and 1100 Degrees Fahr.", by R. F. Miller and G. V. Smith, United States Steel Corp., New York, and G. L. Kehl, Columbia university, New York.

"Rupture Tests at 200 Degrees Cent. on Some Copper Alloys", by E. R. Parker and C. Ferguson, General Electric Co., Schenectady, N. Y.

9:30 A.M.—Lattice Room

"Corrosion of Water Pipes in a Steel Mill", by C. L. Clark, Timken Roller Bearing Co., Canton, O., and W. J. Nungester, University of Michigan, Ann Arbor, Mich.

"A Study of the Iron-Rich Iron-Manganese Alloys", by A. R. Troiano and F. T. McGuire, University of Notre Dame, Notre Dame, Ind.

"The Induction Furnace as a High-Temperature Calorimeter and the Heat of Solution of Silicon in Liquid Iron", by John Chipman and N. J. Grant, Massachusetts Institute of Technology, Cambridge, Mass.

5:00 P.M.—Public Auditorium

Educational Course

"Tool Steels", by J. P. Gill, Vanadium-Alloys Steel Co., Latrobe, Pa.

7:00 P.M.—Ballroom, Hotel Statler

Annual Banquet

Friday, Oct. 16

9:30 A.M.—Grand Ballroom

"The Hardening of Tool Steels", by Peter Payson and J. L. Klein, Crucible Steel Co. of America, New York.

"The Kinetics of Austenite Decomposition in High Speed Steel", by Paul Gordon and Morris Cohen, Massachusetts Institute of Technology, Cambridge, Mass., and R. S. Rose, Vanadium-Alloys Steel Co., Latrobe, Pa.

"The Tempering of Two High-Carbon High-Chromium Steels", by Otto Zmeskal, Illinois Institute of Technology, Chicago, and Morris Cohen, Massachusetts Institute of Technology, Cambridge, Mass.

9:30 A.M.—Parlors 1, 2 and 3

"Some Aspects of Strain Hardenability of Austenitic Manganese Steel", by D. Niconoff, Republic Steel Corp., Cleveland.

"The Precipitation Reaction in Aged Cold-Rolled One Per Cent Cd-Cu: Its Effects on Hardness, Conductivity and Tensile Properties", by R. H. Harrington and L. E. Cole, General Electric Co., Schenectady, N. Y.

"The Effect of Moderate Cold Rolling on the Hardness of the Surface Layer of 0.34 Per Cent Carbon Steel Plates", by Harry K. Herschman, National Bureau of Standards, Washington.

9:30 A.M.—Lattice Room

"The Metallography of Commercial Magnesium Alloys", by J. B. Hess and P. F. George, Dow Chemical Co., Midland, Mich.

"Study of Inverse Segregation Suggests New Method of Making Certain Alloys", by M. L. Samuels, A. R. Elsea and K. Grube, Battelle Memorial Institute, Columbus, O.

"Effects of Various Solute Elements on the Hardness and Rolling Texture of Copper", by R. M. Brick, Yale university, New Haven, Conn.; D. L. Martin, General Electric Co., Schenectady, N. Y.; and R. P. Angier, Handy & Harman, New York.

5:00 P.M.—Public Auditorium

Educational Course

"Tool Steels", by J. P. Gill, Vanadium-Alloys Steel Co., Latrobe, Pa.

TECHNICAL PROGRAM

Headquarters—Hotel Carter

Monday, Oct. 12

10:30 A.M.

Directors' Meeting

12 Noon

Program Committee Lunch

2:30 P.M.

H. H. Timbers, contract license manager, Western Electric Co., New York, Chairman.

Opening Address by Carl E. Johnson, president of the Wire Association.

"The Wire Industry's Part in Industrial Conservation", by Ivon B. Tilyou, assistant utility co-ordinator, Industrial Salvage Section, War Production Board, Washington.

"Mines Above Ground—Conservation of Scrap and Waste Material", motion picture by Western Electric Co., New York.

"Substitute Materials", by speaker from Bell Telephone Laboratories, New York.

Tuesday, Oct. 13

9:30 A.M.

Earle H. Thomas, superintendent, George W. Prentiss Co., Holyoke, Mass., Chairman.

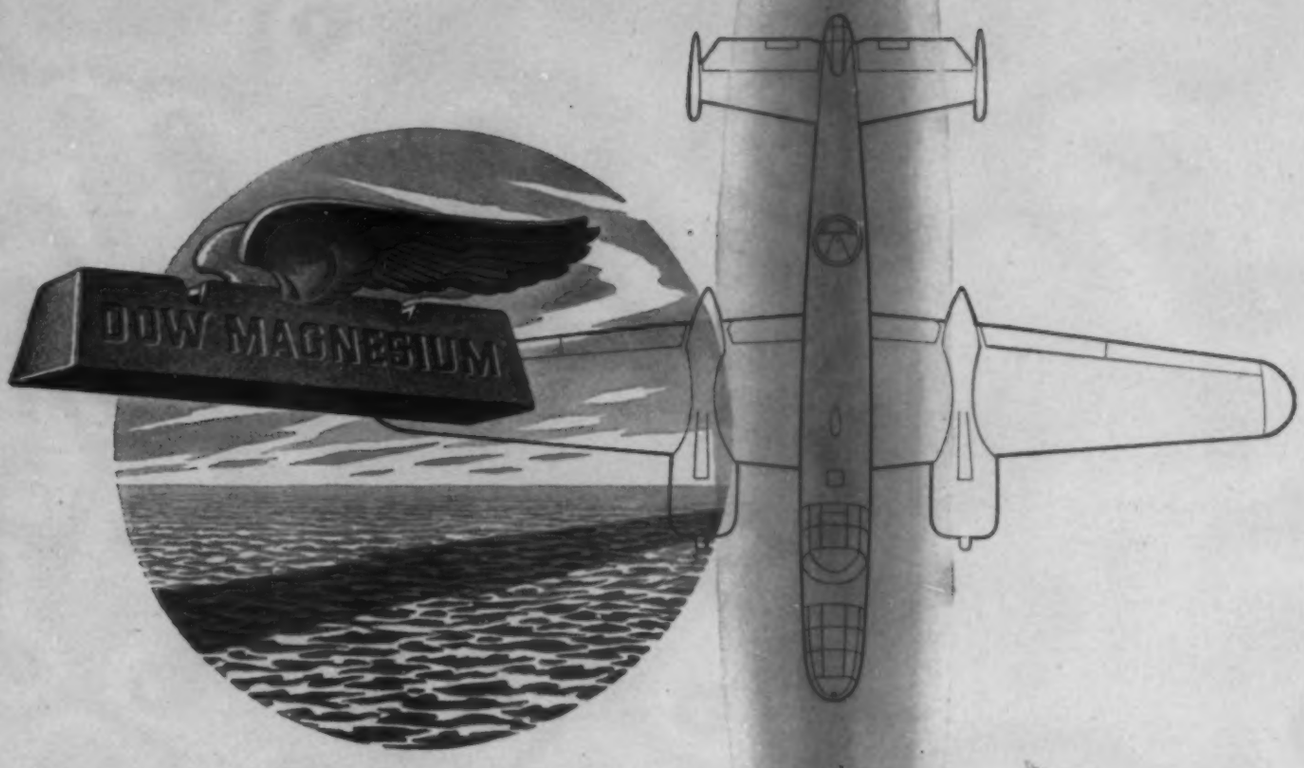
"Reducing Accidents in Wire and Wire Products Operations", by R. H. Ferguson, manager of safety, Republic Steel Corp., Cleveland.

"Scheduling and Planning the Wire Mill for War Production", by L. D. Seymour, assistant works manager, Canada Works, Steel Co. of Canada Ltd., Hamilton, Ont., Canada.

1:00 P.M.

Annual Luncheon

DOW



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4:00 P.M.

Business Meeting

Carl E. Johnson, president, the Wire Association, Chairman.

Wednesday, Oct. 14

9:45 A.M.

W. H. Crawford, resident manager, Eaton Mfg. Co., Massillon, O., Chairman.

"Tungsten Carbide Applications", by A. MacKenzie, vice president in charge of manufacturing, Carboloy Co. Inc., Detroit.

Mordica Memorial Lecture

"Steel and Wire", by Louis H. Winkler, metallurgical engineer, Bethlehem Steel Co., Bethlehem, Pa.

2:00 P.M.

W. B. Farnsworth, chief metallurgist, Pittsburgh Steel Co., Monessen, Pa., Chairman.

"Trouble Shooting on Bronze and Steel Weaving Wire", by L. D. Granger, assistant to vice president, Wickwire Spencer Steel Co., New York.

"Welding Electrodes", by Dr. John W. Miller, metallurgist, Reid-Avery Co., Dundalk, Baltimore.

7:30 P.M.

Annual Dinner—Stag Smoker

Thursday, Oct. 15

9:45 A.M.

A. E. Glen, assistant general manager of sales, Carboloy Co. Inc., Detroit, Chairman.

"Pickling of Rod and Wire", by Walter G. See, sales and service manager, Submerged Combustion Co. of America, Hammond, Ind.

"Electric Patenting of Wire", by John P. Zur, metallurgical engineer, Trauwood Engineering Co., Cleveland.

1:30 P.M.

Plant Inspection—Electric Patenting of Wire.

7:00 P.M.—BALLROOM, HOTEL STATLER

American Society for Metals Dinner.

TECHNICAL PROGRAM

Headquarters—Hotel Statler

Monday, Oct. 12

Institute of Metals Division

AFTERNOON

Copper-Base Alloys

Carl E. Swartz and F. N. Rhines, Chairmen.

"Phase Diagram of the Copper-Iron-Silicon System From 90 Per Cent to 100 Per Cent Copper", by A. G. H. Andersen, metallurgical engineer, Oakdale, N. Y.; and W. A. Kingsbury, research metallurgist, Phelps Dodge Corp., New York.

"Internal Friction of an Alpha Brass Crystal", by Clarence Zener, associate professor of physics, Washington State College, Pullman, Wash.; now at Watertown Arsenal, Watertown, Mass.

"Note on Some Hardness Changes That Accompany the Ordering of Beta Brass", by Cyril Stanley Smith, research supervisor, War Metallurgy Committee, National Academy of Sciences, National Research Council.

Iron and Steel Division

AFTERNOON

Magnetite Reduction: Chromizing: Weldability

L. S. Bergen and A. B. Kinzel, Chairmen.

"A Study of Low-Temperature Gaseous Reduction of a Magnetite", by M. C. Udy and C. H. Lorig, Battelle Memorial Institute, Columbus, O.

"Chromizing of Steel", by I. R. Kramer and Robert H. Hafner, Division of Physical Metallurgy, Naval Research Laboratory, Anacostia station, Washington, D. C.

"Calculated Hardenability and Weldability of Carbon and Low-Alloy Steels", by C. E. Jackson and G. C. Luther, Division of Physical Metallurgy, Naval Research Laboratory, Anacostia station, Washington, D. C.

Tuesday, Oct. 13

Institute of Metals Division

MORNING AND AFTERNOON

Symposium on Rare and Precious Metals

W. P. Sykes and T. A. Wright, Chairmen (Morning).

E. M. Wise and C. B. Sawyer, Chairmen (Afternoon).

"Rare Metals and the War Effort", by W. P. Sykes, consultant, Conservation Division, War Production Board, Washington.

"The Rare Metals and Why They Are Rare", by R. S. Dean, assistant director, United States Bureau of Mines, Washington.

"The Use of Silver During the Emergency", by R. H. Leach, vice president, and John L. Christie, metallurgical manager, Handy & Harman, New York.

"The Effect of Certain Elements on the Rate of Tarnishing of Silver Alloys", by W. E. Campbell, research chemist, Bell Telephone Laboratories, New York.

"Bismuth Solders and Other New Applications of Bismuth", by A. J. Phillips, superintendent, Research Department, American Smelting & Refining Co., New York.

"Elements A La Carte: A Summary of the Status of Artificially Produced Elements and Some of Their Applications", by K. K. Darrow, physicist, Bell Telephone Laboratories, New York.

"Rare Elements in the Electrical Industry", by Porter H. Brace, consulting metallurgist, Research Laboratory, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

"Rare Elements in the Glass Industry", by M. B. Vilensky, chief metallurgist, Owens-Corning Fiberglas Corp., Toledo, O.

"Notes on Refractory Metal-Base Compound Materials", by G. G. Goetzel,

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"Time-To-Fracture Tests on Platinum, Platinum-Iridium, and Platinum-Rhodium Alloy", by H. E. Stauss, research physicist, Baker & Co. Inc., Newark, N. J.

Iron and Steel Division

MORNING

Tensile Properties and Hardenability

J. Hunter Nead and G. R. Brophy, Chairmen.

"True Stress-Strain Relations at High Temperatures by the Two-Load Method", by C. W. MacGregor, associate professor of applied mechanics, Massachusetts Institute of Technology, Cambridge, Mass.; and L. E. Welsh, engineer, Bakelite Corp., New York.

"The Calculation of the Tensile Strength of Normalized Steels from Chemical Composition", by F. M. Walters Jr., director of physical metallurgy, Naval Research Laboratory, Anacostia station, Washington, D. C.

"Effect of Silicon on Hardenability", by Walter Crafts and J. L. Lamont, Union Carbide & Carbon Research Laboratory Inc., Niagara Falls, N. Y.

NOON

Executive Committee Luncheon

AFTERNOON

Open Hearth Steel

Frank G. Norris and Gilbert Soler, Chairmen.

"Duplex Process for Manufacture of Basic Open-Hearth Steel", by H. B. Emerick and S. Feigenbaum, metallurgical department, Jones & Laughlin Steel Corp., Pittsburgh.

"The Effects of Tin on the Properties of Plain Carbon Steel", by J. W. Halley, metallurgist, Inland Steel Co., Chicago.

"Cause of Bleeding in Ferrous Castings", by C. A. Zappfe, research metallurgist, Battelle Memorial Institute, Columbus, O.

Metals Divisions

EVENING—EUCLID BALLROOM

Annual Dinner

Carl E. Swartz, chairman, Institute of Metals Division, Toastmaster.

Earle C. Smith, chairman, Iron and Steel Division, Speaker.

Wednesday, Oct. 14

Institute of Metals Division

NOON

Executive Committee Luncheon

AFTERNOON

Aluminum, Magnesium and Lead

E. E. Schumacher and Dana W. Smith, Chairmen.

"The Rate of Precipitation of Silicon from the Solid Solution of Silicon in Aluminum", by L. K. Jetter, Aluminum Research Laboratory, Aluminum Co. of America, Pittsburgh, and Robert F. Mehl, Department of Metallurgy, Carnegie Institute of Technology, Pittsburgh.

"Equilibrium Diagrams and Lattice Spacing Relationships in the Systems Magnesium - Tin and Magnesium-Lead", by Geoffrey V. Raynor, Inorganic Chemistry Laboratory, University Museum, Oxford, England.

"Constitution of Lead-Rich Lead-Antimony Alloys", by W. S. Pellini, research assistant, and F. N. Rhines, member of staff and assistant professor of Metallurgy, Metals Research Laboratory, Carnegie Institute of Technology, Pittsburgh.

Iron and Steel Division

AFTERNOON

Physical Chemistry of Steelmaking

Charles H. Herty Jr. and W. O. Philbrook, Chairmen.

"Silicon: Oxygen Equilibria in Liquid Iron", by C. A. Zappfe, research metallurgist, and C. E. Sims, supervising metallurgist, Battelle Memorial Institute, Columbus, O.

"Equilibria of Liquid Iron and Simple Basic and Acid Slags in a Rotary Induction Furnace", by C. R. Taylor, research engineer, American Rolling Mill Co., Middletown, O.; and John Chipman, professor of metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

Thursday, Oct. 15

Iron and Steel Division

NOON

Physical Chemistry of Steelmaking Committee Luncheon

TECHNICAL PROGRAM

Headquarters, Hotel Cleveland

Monday, Oct. 12

9:30 A.M.—BALLROOM

Opening Session

G. F. Jenks, president, American Welding Society, Chairman; E. V. David, chairman of Convention Committee, Vice Chairman.

Presentation of Medals and Prizes

10:15 A.M.—BALLROOM

Training of Welding Operators and Qualifications

K. L. Hansen, Harnischfeger Corp., Milwaukee, Chairman; E. T. Scott, Cleveland School of Welding, Cleveland, Vice Chairman.

"Training of Welding Foremen", by F. H. Achard, supervisor of training, Consolidated Edison Co. of New York Inc., New York.

"Instruction Methods in Welding Developed by United States Office of Education", by H. K. Hogan, United States Office of Education, Washington.

12:00 Noon

Opening Metals Exposition

2:00 P. M.—RED ROOM

Fatigue and Impact

A. E. Gibson, Wellman Engineering Co., Cleveland, Chairman; F. L. Plummer, Hammond Iron Works, Warren, Pa., Vice Chairman.

"Fatigue Strength of Metal Subjected to Combined Stresses", by L. H. Donnell, Illinois Institute of Technology, Chicago.

"Fatigue Strength of Commercial Butt Welds in Carbon Steel Plates", by W. M. Wilson, University of Illinois, Urbana, Ill.

"Fatigue Tests of Full Thickness Plates with and Without Butt Welds", by

E. C. Huge, Babcock & Wilcox Co., New York.

"Impact Strength of High Alloy Steel Welds", by E. C. Chapman, Combustion Engineering Co., Chattanooga, Tenn.

2:00 P.M.—Ballroom

War Production

R. J. Kriz, James H. Herron Co., Cleveland, Chairman; A. F. Davis, Lincoln Electric Co., Cleveland, Vice Chairman.

"Some Special Applications of Flame Hardening", by Stephen Smith, Air Reduction Sales Co., New York.

"High Quality Welding—Vertical and Overhead Positions with Alternating Current", by H. O. Westendarp, General Electric Co., Schenectady, N. Y.

"Conservation and Effective Use of Equipment and Supplies for Welding and Cutting", by H. Ullmer, The Linde Air Products Co., New York.

"Welding Gun Mounts", by W. B. Lair, York Safe & Lock Co., York, Pa.

6:30 P.M.—Rose Room

Industrial Research Dinner

7:30 P.M.—Red Room

Motion Picture Films

"The Inside of Welding", by General Electric Co., Schenectady, N. Y.

"The Welding of Aluminum", by Aluminum Co. of America, Pittsburgh.

"The Welding Technique", by Oklahoma Agricultural and Mechanical college, Stillwater, Okla.

Tuesday, Oct. 13

9:30 A.M.—Ballroom

Weldability of Steel

A. B. Kinzel, Union Carbide & Carbon Research Laboratories, New York, Chairman; A. E. Marble, Firestone Tire & Rubber Co., Akron, O., Vice Chairman.

"What Happens to Residual Stresses in Service", by J. T. Norton and D. Rosenthal, Massachusetts Institute of Technology, Cambridge, Mass.

"Effects of Cooling Rate on the Properties of Arc Welded Joints", by W. F. Hess, Rensselaer Polytechnic Institute, Troy, N. Y.

"Weld Quench Gradient Tests", by W. H. Bruckner, University of Illinois, Urbana, Ill.

9:30 A.M.—Red Room

Aircraft Welding (Fuselage)

P. H. Merriman, Glenn L. Martin Co., Baltimore, Chairman; J. F. Maine, Republic Structural Iron Works, Cleveland, Vice Chairman.

"Welding of Airplane Propeller Blades", by C. A. Liedholm, Curtiss-Wright Corp., New York.

"Welding of New Types of Alloy Steels for Aircraft Structures", by A. R. Lytle and K. H. Koopman, Union Carbide & Carbon Research Laboratories, New York.

"Effect of Current on the Welding of X4130 Sheet and Tubing", by W. T. Tiffin, University of Oklahoma, Norman, Okla.

2:00 P.M.—Ballroom

Weldability of Steel

C. H. Jennings, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Chairman; G. B. Carson, Case School of Applied Science, Cleveland, Vice Chairman.

"Weldability of Carbon-Manganese Steels", by O. E. Harder and C. B. Voldrich, Battelle Memorial Institute, Columbus, O.

"Weldability Tests of Carbon-Manganese Steels", by C. E. Jackson, M. A. Pugacz and G. G. Luther, Naval Research Laboratory, Anacostia Station, Washington, D. C.

"Jominy End Quench Hardenability Tests on Carbon-Manganese Steels", by G. A. Timmons, Climax Molybdenum Co., New York.

"Tee-Bend Tests on Carbon-Manganese Steels", by L. C. Bibber and J. Heuschkel, Carnegie-Illinois Steel Corp., Pittsburgh.

2:00 P.M.—Assembly Room B

Aircraft Welding (Sheet)

G. O. Hoglund, Aluminum Co. of America, New Kensington, Pa., Chairman; John D. Gordon, Taylor-Winfield Corp., Warren, O., Vice Chairman.

"Spot Welding in Aircraft Structures", by E. S. Jenkins, Curtiss-Wright Corp., New York.

"Standards and Recommended Practices and Procedures for Spot Welding Aluminum Alloys", by G. S. Mikhalapov, Taylor-Winfield Corp., Warren, O.; chairman of Aircraft Welding Standards Committee.

"Arc Welding of Magnesium Alloys", by W. S. Loose and A. R. Orban, Dow Chemical Co., Midland, Mich.

"Welding—Its Application to Aircraft", by Francis H. Stevenson, Vega Aircraft Corp., Glendale, Calif.

2:00 P.M.—Red Room

Gas Cutting

J. R. Dawson, Union Carbide & Carbon Research Laboratories, Niagara Falls, N. Y., Chairman; O. L. Smith, Weldit Acetylene Co., Detroit, Vice Chairman.

"Gas Cutting in Steel Mills", by S. D. Baumer, Air Reduction Sales Co., New York.

"Improved Methods of Machine Flame Cutting", by H. E. Rockefeller, The Linde Air Products Co., New York.

"Gas Cutting in Shipbuilding", by R. F. Helmkamp, Air Reduction Sales Co., New York.

7:30 P.M.—Red Room

Fundamental Research Conference

H. C. Boardman, Chicago Bridge & Iron Co., Chicago, Chairman.

Wednesday, Oct. 14

9:30 A.M.—Assembly Room B

Resistance Welding

G. N. Sieger, S-M-S Corp., Detroit, Chairman; B. L. Wise, Federal Machine & Welder Co., Warren, O., Vice Chairman.

"Refrigerant Cooled Spot Welding Electrodes", by F. R. Hensel, E. I. Larsen and E. F. Holt, P. R. Mallory & Co., Indianapolis.

"Spot Welding of 0.040-Inch Thickness SAE X4130 Steel", by W. F. Hess and D. C. Herrschaft, Rensselaer Polytechnic Institute, Troy, N. Y.

"Unusual Resistance Welding Developments and Operations", by R. T. Gillette, General Electric Co., Schenectady, N. Y.

"Resistance Welding Trench Mortar Fin Assembly", by J. H. Cooper, Taylor-Winfield Corp., Warren, O.

9:30 A.M.—Red Room

Production Welding

O. B. J. Fraser, International Nickel Co., New York, Chairman; D. H. Corey, Detroit Edison Co., Detroit, Vice Chairman.

"Welding with Aluminum Bronze", by Clinton E. Swift, Ampco Metal Inc., Milwaukee.

"Adapting Automatic Electric Welding to Routine Production", by J. M. Keir, The Linde Air Products Co., New York.

"Welded Steel Tube and Its Application in War Production", by H. S. Card, Formed Steel Tube Institute, New York.

2:00 P.M.—Assembly Room B

Resistance Welding

R. E. Powell, Western Electric Co., Kearny, N. J., Chairman; J. D. Tebben, P. R. Mallory & Co., Indianapolis, Vice Chairman.

"The Spot Welding of NAX High Tensile Steel", by C. R. Schroder, Great Lakes Steel Corp., Ecorse, Mich.

"Application of Copper Oxide Rectifiers for Resistance Welding", by R. L. Briggs, Thomson-Gibb Electric Welding Co., Lynn, Mass.

"The Effect of Weld Spacing on the Strength of Spot-Welded Joints", by

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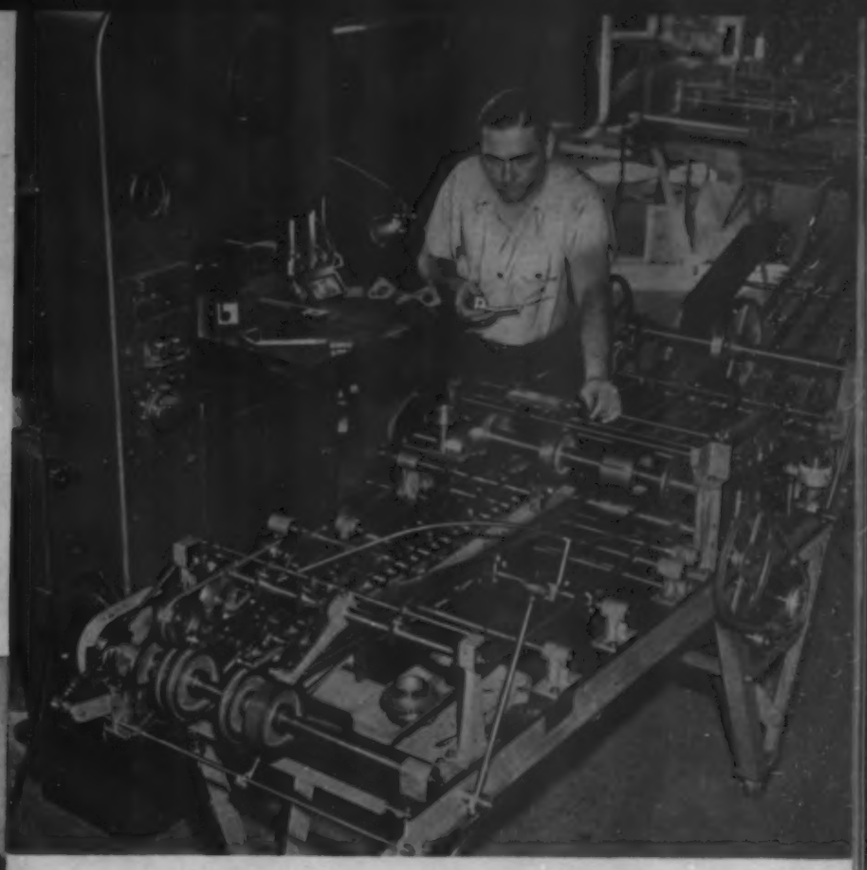

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● In addition to doing a fine job in regular production work, the DoAll is the 100% patriot today to which you can turn in emergencies.

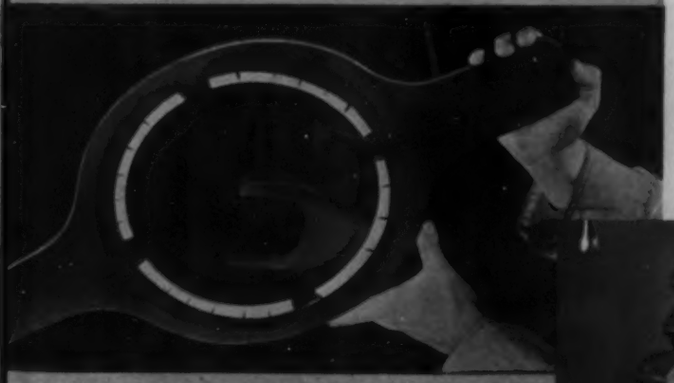
Don't tie up vital machines for weeks waiting for replacement parts from the factory. Make them on the DoAll—the fastest precision method for external and internal cutting without waste, of all kinds of metals, alloys, plastics, wood, etc. Finished jobs are ready for use—further machining is not necessary.

The DoAll also makes special tools and dies, following a hairline layout in the least possible time. Short runs of metal products can be handled on the DoAll, relieving heavier, higher-priced machine tools for other work. Sheet metal or alloy can be stacked and 20 to 80 parts cut out at one time.

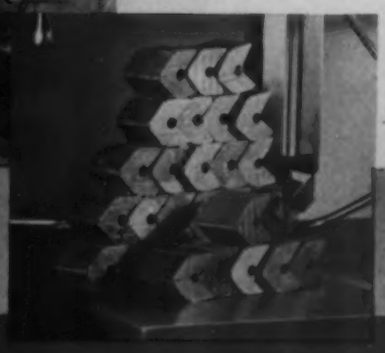
ASK FOR DEMONSTRATION

A factory-trained man will call with a DoAll and show you its production versatility, economy and time-saving features.

READ THIS BOOK—Send for a copy of "DoAll on Production", a picture story of this little giant of industry.



A large airplane plant makes these Propeller Wrenches on the DoAll.



32 Stitching Dies 1¾" thick cut from oil hardening tool steel in 23½ hours on the DoAll

CONTINENTAL MACHINES, INC.
1324 S. Washington Ave., Minneapolis, Minn.
Associated with the DoAll Company, DesPlaines, Illinois, Manufacturers of Band Saws and Band Files for DoAll Contour Machines

R. Della-Vedowa and M. M. Rockwell, Lockheed Aircraft Corp., Burbank, Calif.

"Preparation of Aluminum Alloy for Spot Welding", by T. E. Piper, Northrop Aircraft Inc., Hawthorne, Calif.

2:00 P.M.—Ballroom

Welding and Cutting of Ordnance

H. L. B. Whitney, War Production Board, Washington, Chairman; H. C. Boardman, Chicago Bridge & Iron Co., Chicago, Vice Chairman.

"Factors Affecting the Accuracy of Ordnance Machine Cutting", by Howard Hughey and H. A. Yoch, Air Reduction Sales Co., Philadelphia.

"Manual and Automatic Welding of Heavy Plate of Hardenable Alloys", by L. A. Danse, Cadillac Motor Car Division, Detroit.

"Developments in Cast Iron Welding Rods and Electrodes", by R. J. Franklin, Chicago Hardware Foundry Co., North Chicago, Ill.

"Electric Welding of Mobile Artillery Gun Carriages", by G. E. Campbell, Pettibone-Mulliken Corp., Chicago.

2:00 P.M.—Red Room

Shipbuilding

David Arnott, American Bureau of Shipping, New York, Chairman; A. L. Pfeil, Universal Power Corp., Cleveland, Vice Chairman.

"Suggested Methods Which Will Increase Welding Production and Decrease Welding Costs", by J. F. Lincoln, Lincoln Electric Co., Cleveland.

"Distortion and Shrinkage Problems in Ships and Other Large Structures", by LaMotte Grover, Air Reduction Co., New York.

"Motor Boat Construction and Small Ships", by W. E. Whitehouse, Defoe Shipbuilding Co., Bay City, Mich.

"Application of Welding in Submarine Construction", by E. H. Ewertz, Electric Boat Co., New York; and R. D. West, Manitowoc Shipbuilding Co., Manitowoc, Wis.

7:30 P.M.—Rose Room

Section Officers' Dinner and Conference

Thursday, Oct. 15

9:30 A.M.—Red Room

Aircraft Welding

S. L. Hoyt, Battelle Memorial Institute, Columbus, O., Chairman; E. Vom Steeg, General Electric Co., New York, Vice Chairman.

"Utility Characteristics of Aircraft Electrodes", by C. B. Voldrich and R. D. Williams, Battelle Memorial Institute, Columbus, O.

"Results of Survey on Current Arc Welding Practice in Aircraft Industry", by Maurice Nelles, chairman, Western Aircraft Welding Committee.

"Copper Welding for Aircraft", by T. V. Buckwalter, Timken Roller Bearing Co., Canton, O.

9:30 A.M.—Assembly Room B

Non-Destructive Tests and Inspection

J. J. Crowe, Air Reduction Sales Co., New York, Chairman; O. R. Carpenter, Babcock & Wilcox Co., New York, Vice Chairman.

"Correlation of Metallographic and Radiographic Examinations of Spot Welds in Aluminum Alloys", by Dana W. Smith and Fred Keller, Aluminum Co. of America, Pittsburgh.

"The Magnetic Powder Method for Inspecting Weldments and Castings for Sub-Surface Defects", by Carleton Hastings, Watertown Arsenal, Watertown, Mass.

"Radiographic Inspection of Welded Armor Plates and Castings", by Don M. McCutcheon, Ford Motor Co., Dearborn, Mich.

"Visual Inspection of Arc Welds", by W. L. Warner, Watertown Arsenal, Watertown, Mass.

2:00 P.M.—Rose Room

Business Meeting

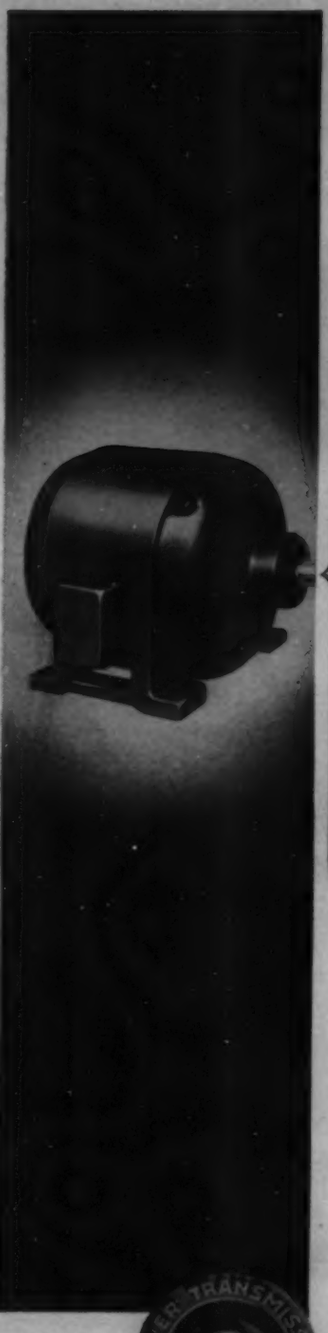
3:00 P.M.—Room 1

Board of Directors Meeting

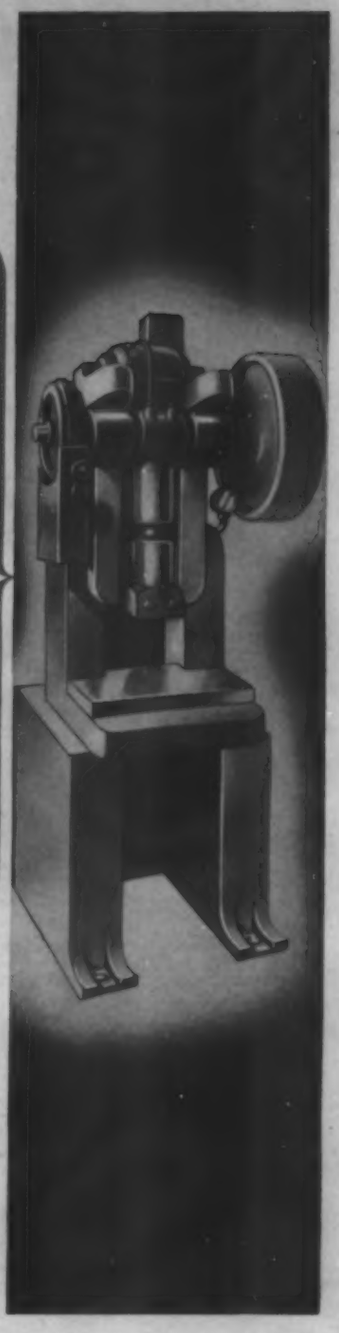
Attempting to raid an R.A.F. desert camp in Libya, this Junkers 88 became a mass of wreckage when shot down by British night fighters. British official photo

In this vital gap . . .

between prime mover and the machine to be operated



PLANNED POWER TRANSMISSION



helps win the battle of production, because it saves power—improves power factor—lowers connected load—reduces maintenance—cuts unit cost—increases production

PLANNED POWER TRANSMISSION is the proper selection, use and maintenance of power transmission machinery.

This book, yours for the asking, explains PLANNED POWER TRANSMISSION. Not a catalogue, not a selling piece. But a contribution by our industry to the winning of America's great battle of production.

SEND FOR IT TODAY

POWER TRANSMISSION COUNCIL INC.

53-63 PARK ROW NEW YORK, N.Y.

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POWER TRANSMISSION COUNCIL, INC.
53-63 Park Row, New York, N. Y.

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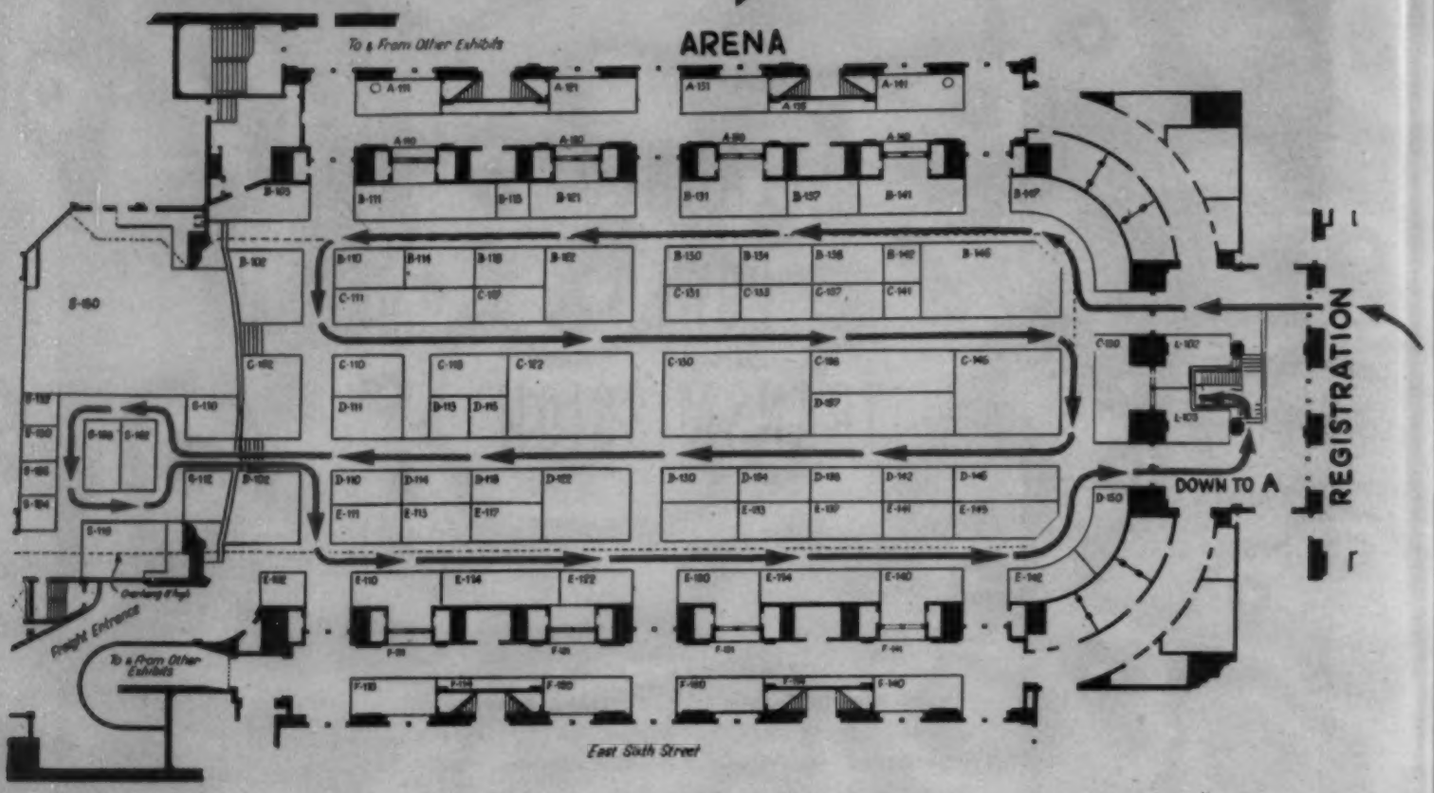
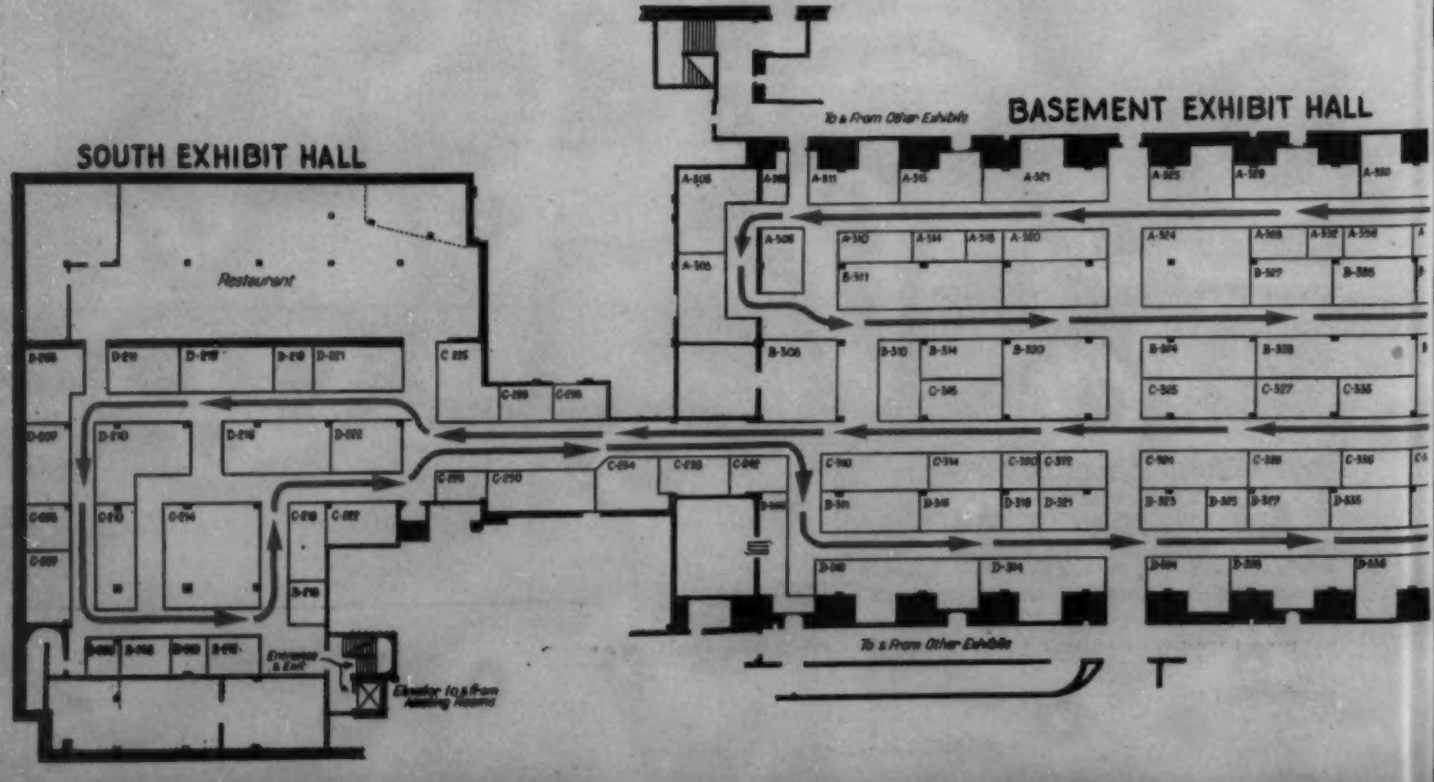


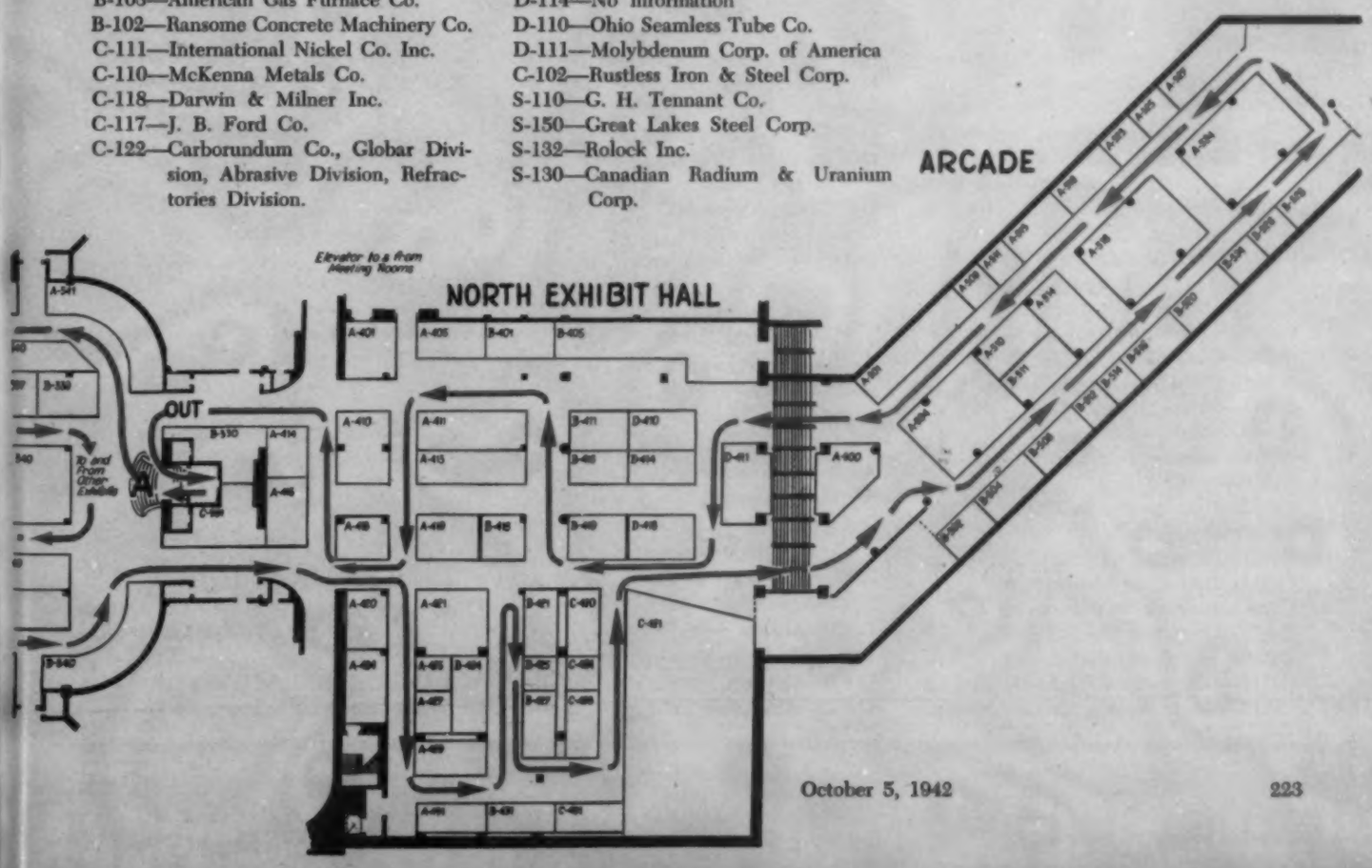


Metal Exposition

. . . . by taking this course through the exhibits. If you follow the arrows on the above floor plan, you will see the exhibits in the order given below. If you wish to find the location of some particular company's booth, you will find an alphabetical listing on page 227

Enter from Lakeside avenue. Register in lobby. Enter arena by righthand (western) door.

L-102—Chicago Steel Foundry Co.
C-150—Firth-Sterling Steel Co.
B-147—A. F. Holden Co.
B-146—Lindberg Engineering Co.
B-142—Brush Development Co.
B-141—Doall Cleveland Co. Inc.
B-137—Anderson & Brown Co.
B-138—Tempil Corp.
B-134—Parker-Kalon Corp.
B-130—National Machine Works
B-131—Ampco Metal Inc.
B-121—Chilton Co. Inc.
B-122—Picker X-Ray Corp.
B-118—Andrew King
B-115—Sterling Alloys Inc.
B-111—Dow Chemical Co.
B-114—Martindale Electric Co.
B-110—Duraloy Co.
B-103—American Gas Furnace Co.
B-102—Ransome Concrete Machinery Co.
C-111—International Nickel Co. Inc.
C-110—McKenna Metals Co.
C-118—Darwin & Milner Inc.
C-117—J. B. Ford Co.
C-122—Carborundum Co., Globar Division, Abrasive Division, Refractories Division.
C-130—Pangborn Corp.
C-131—Bastian-Blessing Co.
C-133—Continental Industrial Engineers Inc.
C-137—Wilson Mechanical Instrument Co. Inc.
C-141—Behr-Manning Corp.
C-138—Norton Co.
C-146—General Alloys Co.
D-146—Black Drill Co.
D-142—Hevi Duty Electric Co.
D-138—Armstrong Cork Co.
D-137—E. F. Houghton & Co.
D-134—E. I. du Pont de Nemours & Co.
D-130—No information
D-122—Hammond Machinery Builders Inc.
D-118—Surface Combustion Division, General Properties Co. Inc.
D-115—No information
D-113—Atlas Steels Ltd.
D-114—No information
D-110—Ohio Seamless Tube Co.
D-111—Molybdenum Corp. of America
C-102—Rustless Iron & Steel Corp.
S-110—G. H. Tennant Co.
S-150—Great Lakes Steel Corp.
S-132—Rolock Inc.
S-130—Canadian Radium & Uranium Corp.
S-126—C. J. Tagliabue Mfg. Co.
S-124—Gray Machine Co.
S-116—No information
S-158—Welding Engineer Publishing Co.
S-162—Alvey Ferguson Co.
S-112—Park Chemical Co.
D-102—Selas Co.
E-102—Claud S. Gordon Co. of Ohio
E-111—Adolph I. Buehler
E-110—George Scherr & Co.
E-113—Advance Polishing Wheels Inc., Matchless Metal Polish Co.
E-117—Automatic Temperature Control Co. Inc.
E-114—Chicago Flexible Shaft Co., Stewart Industrial Furnace Division, Kelley-Koett Mfg. Co. Inc.
E-122—Industrial Press
E-130—Kold-Hold Mfg. Co.
E-134—Oakite Products Inc.
E-133—Illinois Testing Laboratories Inc.
E-137—McGraw Hill Publishing Co.
E-141—Spencer Turbine Co.
E-140—Eutectic Welding Alloys Co.
E-143—Penton Publishing Co., (STEEL,



THE FOUNDRY, MACHINE DESIGN, DAILY METAL TRADE, NEW EQUIPMENT DIGEST)

E-142—S. K. Wellman Co.
D-150—Bausch & Lomb Optical Co.
L-103—Conover-Mast Corp.

Go downstairs to underground exhibit hall.

B-339—Wall Colmonoy Corp.
A-341—Lester-Phoenix Inc.
A-340—Progressive Welder Co.
A-335—National Machinery Co.
A-336—Titanium Alloy Mfg. Co.
A-332—Heil & Co.
A-328—Victor Saw Works Inc.
A-329—Gulf Oil Corp., Gulf Refining Co.
A-325—Delaware Tool Steel Corp.
A-324—Ohio Crankshaft Co.
A-320—Magnaflux Corp.
A-321—American Brass Co.
A-318—Eastman Kodak Co.
A-314—Hitchcock Publishing Co.
A-315—Marquette Mfg. Co.
A-310—Crown Rheostat & Supply Co.
A-311—Precise Tool & Mfg. Co.
A-309—Cleveland Tapping Machine Co.
A-305—No information
A-303—No information
A-306—Sperry Products Inc.
B-311—N. Ransohoff Inc.
B-310—Wells Mfg. Corp.
B-314—American Car & Foundry Co.
B-320—Meehanite Research Institute of America (American Brake Shoe & Foundry, Atlas Foundry Co., Banner Iron Works, Barnett Foundry & Machine Co., H. W. Butterworth & Sons, Farrel-Birmingham Co., Florence Pipe Foundry & Machine Co., Fulton Foundry & Machine Co., General Foundry & Mfg. Co., Greenlee Foundry Co., Hamilton Foundry & Machine Co.; Kanawha Mfg. Co., Kinney Iron Works, Koehring Co., Henry Perkins Co., Pohlman Foundry Co., Rosedale Foundry & Machine Co., Ross-Meehan Foundries, Stearns-Rogers Mfg. Co., Valley Iron Works, Vulcan Foundry Co., Warren Foundry & Pipe Corp.)
B-324—Carboloy Co. Inc.
B-328—No information
B-327—Chase Brass & Copper Co.
B-335—Globe Machine & Stamping Co.
B-337—Philips Metalix Corp.
B-340—Minnesota Mining & Mfg. Co.
C-340—Lukens Steel Co.
C-336—J. W. Kelley Co.
C-335—Instrument Specialties Co. Inc.
C-327—Phillips Mfg. Co.
C-328—Ohio Carbon Co.
C-324—Hild Floor Machine Co.
C-325—Babcock & Wilcox Co.
C-322—Cleveland Graphite Bronze Co.,
C-320—Nicholson File Co.
C-314—Independent Pneumatic Tool Co.
C-315—W. J. Holliday & Co., Monarch Steel Co.
C-310—D. A. Stuart Oil Co. Ltd.
B-306—Revere Copper & Brass Co.
C-233—Tel Autograph Corp.
C-229—Atlas Publishing Co.
C-225—No information
D-222—No information
D-221—No information
D-219—No information
D-216—No information
D-215—No information
D-211—No information
D-210—No information
D-203—No information
D-207—No information
C-203—Chilton Co. Inc.
C-210—No information
C-207—No information
B-206—No information
B-208—No information
B-210—Andresen Inc.
B-212—No information
C-214—No information
B-218—No information
C-218—No information
C-222—No information
C-226—Safety Socket Screw Corp.
C-230—No information
C-232—Detecto Scales Inc.
C-234—No information
C-238—General Aniline & Film Corp., Agfa Ansco Division
C-242—H & H Research Co.
D-306—No information
D-310—Triplex Machine Tool Corp.; City Engineering Co.; Hamilton Tool Co.; Ultrahap Machine Co.
D-311—Detroit Rex Products Co.
D-315—Electro Refractories & Alloys
D-314—Handy & Harman
D-319—American Metal Market Co.
D-321—Mall Tool Co.
D-323—Manhattan Rubber Mfg. Co.
D-324—Tide Water Associated Oil Co.
D-325—National Industrial Publishing Co.
D-327—Magnetic Analysis Corp.
D-328—Lepel High Frequency Laboratories
D-335—Machinery Mfg. Co.
D-336—Standard Oil Co. of Ohio
D-340—American Foundry Equipment Co.
C-331—No information
A-420—National Refining Co.
A-421—No information
A-424—Elastic Stop Nut Corp.
A-425—Wire Association
A-427—American Welding Society
A-429—Standard X-Ray Machine Co.
A-431—Pittsburgh Pipe Cleaner Co.
B-424—Commerce Pattern Foundry & Machine Co.
B-421—Anderson & Sons
B-425—No information
B-427—Osborn Mfg. Co.
B-431—A. P. de Sanno & Son Inc.
C-431—Gardner Publications Inc.
C-421—Aluminum Co. of America, Aluminum Ore Co., American Magnesium Corp.
C-428—Niagara Blower Co.
C-424—R. W. Cramer Co. Inc.
C-420—Krouse Testing Machine Co.
B-502—Alloy Castings Co.
B-504—Radium Chemical Co., Inc.
A-504—Vascoloy-Ramet Corp.
B-508—American Institute of Mining & Metallurgical Engineers Inc.
B-511—Experimental Tool & Die Co.
B-512—No information
B-514—Steel Publications Inc.
A-514—Catskill Metal Works Inc.
B-516—Alox Corp.
B-520—Chemical Rubber Co.
A-518—Sciaky Bros.
B-524—C. Walker Jones Co.
B-526—Metal Industry Publishing Co.
A-524—No information
A-527—No information
A-525—American Brake Shoe & Foundry Co., American Manganese Steel Division
A-523—Sparkler Mfg. Co.
A-519—Porter-Cable Machine Co.
A-513—Reinhold Publishing Corp.
A-511—Morse Magneto Clock Co.
A-509—Brickseal Refractory Co.
A-510—Vanadium Corp. of America
A-501—Climax Molybdenum Co.
A-500—Resistance Welders Manufacturers Association (Acme Electric Welding Co., Eisler Engineering Co., Electroloy Co. Inc., Expert Welder Co., Federal Machine & Welder Co., P. R. Mallory & Co. Inc., Multi-Hydromatic Welding & Mfg. Co., National Electric Welding Machine Co., Progressive Welder Co., S-M-S Corp., Swift Electric Welder Co., Taylor-Hall Welding Corp., Taylor-Winfield Corp., Thomson-Gibb Electric Welding Co., Welding Machines Mfg. Co., Welding Sales & Engineering Co.)
D-410—A. Schrader's Son
D-414—Tinnerman Products Inc.
D-411—Bridgeport Brass Co.
D-418—Mahr Mfg. Co.
B-419—Buckeye Garment Rental Co.
B-418—Gray Mills Co. Inc.
B-415—Baker & Co. Inc.
B-411—Sentry Co.
B-405—Westinghouse Electric & Mfg. Co.
A-401—Motor Products Corp., Deep-
A-405—Harold E. Trent Co.
A-401—Motor Products Co., Deep-freeze Division
A-410—Harry W. Dietert Co.
A-411—Charles Bruning Co. Inc.
A-415—Despatch Oven Co.
A-419—Reeves Pulley Co.
A-418—American Machine & Metals Inc., Riehle Testing Machine Division
A-416—Industrial Publishing Co.
A-414—Morrison Engineering Co.

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in Salem War Production Furnaces

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● ● ● ● This type Salem batch furnace heats ingots, billets, and slabs. It heats plain, high carbon and alloy steels equally well since the heating cycle, atmosphere, pressure, and time elements are under strict control. Scientific discharge of waste gases assures uniform heating on low firing rates. Production capacity of alloy steel exceeds 6 tons an hour at 2250° F. The chambers (9' x 16') are double and each has two doors. Only two men synchronize loading, heating, and unloading operations, providing EXTRA production with low operating costs. Salem offers all types of heat treating equipment with special performance features. Write today.

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Exhibitors' Alphabetical Listing

A

Company — Booth

Acme Electric Welding Co., Huntington Park, Calif. — A-500
Resistance welders.

Advance Polishing Wheels Inc., Chicago — E-113
Polishing wheels.

Alloy Castings Co., Champaign, Ill. — B-502
Castings.

Alox Corp., Niagara Falls, N. Y. — B-516
Corrosion preventatives and lubricants.

Aluminum Co. of America, Pittsburgh; **Aluminum Ore Co.**, East St. Louis, Ill.; **American Magnesium Corp.**, Cleveland — C-421
Aluminum ore and alloys; magnesium and its alloys.

Alvey Ferguson Co., Cincinnati — S-162
Conveying machinery.

American Brake Shoe & Foundry Co., New York — B-320
Brake shoes, iron castings.

American Brake Shoe & Foundry Co., American Manganese Steel Division, Chicago Heights, Ill. — A-525
Alloy castings for heat and corrosion service.

American Brass Co., Waterbury, Conn. — A-321
Copper alloys, welding rods.

American Car & Foundry Co., New York — B-314
Electric bar, forging and rivet heaters.

American Foundry Equipment Co., Mishawaka, Ind. — D-340
Airless abrasive cleaning and descaling equipment.

American Gas Furnace Co., Elizabeth, N. J. — B-103
Gas heat treating furnaces; burners, accessories.

American Institute of Mining & Metallurgical Engineers Inc., New York — B-508
Educational exhibit.

American Machine & Metals Inc., Riehl Testing Machine Division, East Moline, Ill. — A-418
Testing machines.

American Metal Market Co., New York — D-319
Publications: *American Metal Market.*

American Welding Society, New York — A-427
Educational exhibit.

Ampco Metal Inc., Milwaukee — B-131
Welding rods and high-strength nonferrous alloys.

Anderson & Brown Co., Cleveland — B-137
Magnetic chucks.

Anderson & Sons, Westfield, Mass. — B-421
Name plates, signs, dials and novelties, imprinting machines.

Andresen Inc., Pittsburgh — B-210
Publications.

Armstrong Cork Co., Lancaster, Pa. — D-138
Insulating firebrick and cements.

Atlas Foundry Co., Detroit — B-320
Alloy castings.

Atlas Publishing Co., New York — C-229
Publications.

Atlas Steels Ltd., Welland, Ont., Canada — D-113
Alloy and carbon tool steels.

Automatic Temperature Control Co. Inc., Philadephia — E-117
Valves and controllers.

B

Babcock & Wilcox Co., New York — C-325
Refractories.

Baker & Co. Inc., Newark, N. J. — B-415
Platinum wire, rod and sheet.

Banner Iron Works, St. Louis — B-320
Alloy castings.

Barnett Foundry & Machine Co., Irvington, N. J. — B-320
Alloy castings.

Bastian-Blessing Co., Chicago — C-131
Welding and cutting equipment.

Bausch & Lomb Optical Co., Rochester, N. Y. — D-150
Optical instruments for metallography, spectrography.

Behr-Manning Corp., Troy, N. Y. — C-141
Small power tools.

Black Drill Co., Cleveland — D-146
Drills.

Brickseal Refractory Co., Hoboken, N. J. — A-509
Refractories.

Bridgeport Brass Co., Bridgeport, Conn. — D-411
Brass and copper mill products.

Bruning Co. Inc., Charles; Chicago — A-411
Printing machines.

Brush Development Co., Cleveland — B-142
Surface smoothness testers.

Buckeye Garment Rental Co., Cleveland — B-419
Clothing.

Buehler, Adolph I.; Chicago — E-111
Metallographic and laboratory equipment.

Butterworth & Sons, H. W.; Bethayres, Pa. — B-320
Castings.

C

Canadian Radium & Uranium Corp., New York — S-130
Radiographic equipment.

Carboloy Co. Inc., Detroit — B-324
Cemented carbide tools and dies.

Carborundum Co., Globar Division, Abrasive Division, Refractories Division, Niagara Falls, N. Y. — C-122
Abrasive materials; refractories; nonmetallic electric heating elements.

Catskill Metal Works Inc., Catskill, N. Y. — A-514
Power machines.

Chase Brass & Copper Co., Waterbury, Conn. — B-327
Nonferrous metals.

Chemical Rubber Co., Cleveland — B-520
Laboratory supplies.

Chicago Flexible Shaft Co., Stewart Industrial Furnace Division, Chicago — E-114
Flexible shaft drives; industrial furnaces.

Chicago Steel Foundry Co., Chicago — L-102
Castings.

Chilton Co., Philadelphia — B-121, C-203
Publications: *Automotive and Aviation Industries; Iron Age.*

Cleveland Graphite Bronze Co., Cleveland — C-322
Nonferrous castings.

Cleveland Tapping Machine Co., Cleveland — A-309
Tapping machines.

Climax Molybdenum Co., New York — A-501
Molybdenum alloy steels and irons.

Commerce Pattern Foundry & Machine Co., Upton Electric Furnace Division, Detroit — B-424
Industrial furnaces; castings.

Conover-Mast Corp., New York — L-103
Publications: *Mill & Factory.*

Continental Industrial Engineers Inc., Chicago — C-133
Heat-treating furnaces.

Cramer Co. Inc., R. W.; Centerbrook, Conn. — C-424
Control equipment.

Crown Rheostat & Supply Co., Chicago — A-310
Electroplating equipment and supplies.

D

DAILY METAL TRADE, Cleveland — E-143
Publications.

Darwin & Milner Inc., Cleveland — C-118
Tool steels.

Delaware Tool Steel Corp., Wilmington, Del. — A-325
Tool steels.

De Sanno & Son Inc., A. P.; Phoenixville, Pa. — B-431
Abrasive cutting and grinding equipment.

Company	Booth
Despatch Oven Co., Minneapolis Gas heat-treating furnaces.	A-415
Detecto Scales Inc., Brooklyn, N. Y. Weighing equipment.	C-232
Detroit Rex Products Co., Detroit Cleaning equipment.	D-311
Dietert Co., Harry W.; Detroit Spectographic equipment; testing equipment.	A-410
Doall Cleveland Co. Inc., Cleveland Machine tools.	B-141
Dow Chemical Co., Midland, Mich. Magnesium alloys.	B-111
DuPont de Nemours & Co., E. I.; Wilmington, Del. Chemicals.	D-134
Duraloy Co., Scottdale, Pa. Steel castings, pipe, tubes, valves, etc.	B-110

E

Eastman Kodak Co., Rochester, N. Y. Industrial radiographic and X-ray equipment.	A-318
Eisler Engineering Co., Newark, N. J. Resistance welders.	A-500
Elastic Stop Nut Corp., Union, N. J. Self-locking nuts.	A-424
Electro Refractories & Alloys, Buffalo Refractories; alloys.	D-315
Electroloy Co. Inc., Bridgeport, Conn. Resistance welding electrodes.	A-500
Eutectic Welding Alloys Co., New York Welding alloys.	E-140
Experimental Tool & Die Co., Detroit Tools.	B-511
Expert Welder Co., Detroit Resistance welders.	A-500

F

Farrel-Birmingham Co., Ansonia, Conn. Rolls, machinery and castings.	B-320
Federal Machine & Welder Co., Warren, O. Electric welding machines.	A-500
Federal Products Corp., Providence, R. I. Precision measuring instruments.	B-401
Firth-Sterling Steel Co., McKeesport, Pa. Carbide tools, dies; stainless, wear-resisting steels.	C-150
Florence Pipe Foundry & Machine Co., Philadelphia Castings.	B-320
Ford Co., J. B.; Wyandotte, Mich. Cleaning and washing compounds.	C-117
FOUNDRY, THE; Cleveland Publications.	E-143
Fulton Foundry & Machine Co., Cleveland Castings.	B-320

G

Gardner Publications Inc., Cincinnati Publications: *Products Finishing, Modern Machine Shop; El Taller Mecanico Moderno; Oficina Mecanica Moderna.*	C-431
General Alloys Co., Boston Heat and corrosion-resisting alloys.	C-146
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Gulf Oil Corp., Gulf Refining Co., Pittsburgh Cutting and quenching oils.	A-329

H

H & H Research Co., Detroit Portable electric tools.	C-242
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I

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Industrial Publishing Co., Cleveland Publications: *Industry & Welding.*	A-416
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International Nickel Co. Inc., New York Nickel and nickel alloys.	C-111

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Jones Co., C. Walker; Philadelphia Protective clothing.	B-524

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Kanawha Mfg. Co., Charleston, W. Va. Castings.	B-320
Kelley Co., J. W.; Cleveland Industrial oils and heat-treating supplies.	C-336
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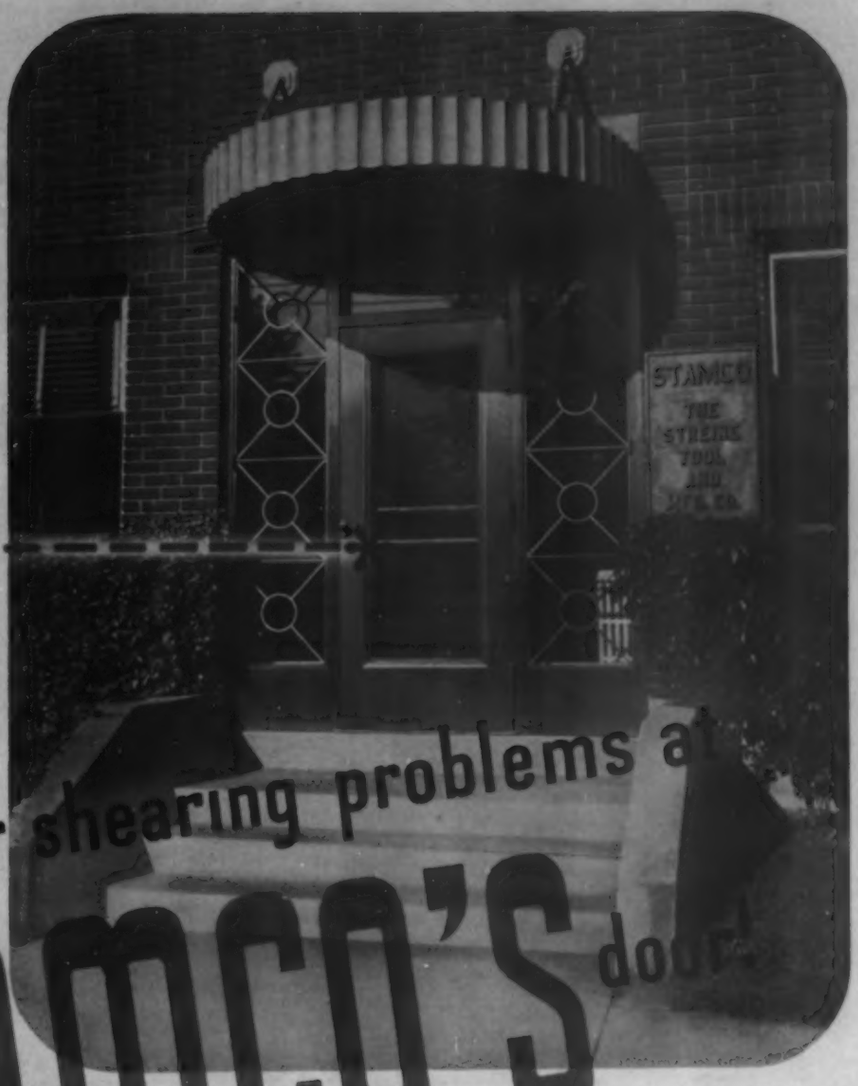

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Rustless Iron & Steel Corp., Baltimore, Md. C-102
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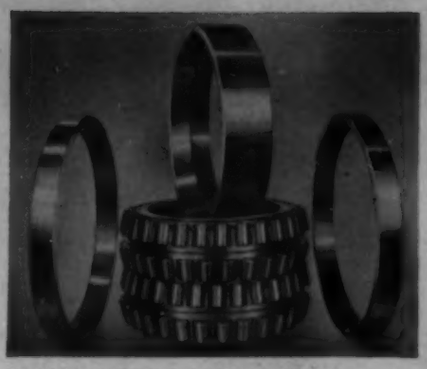
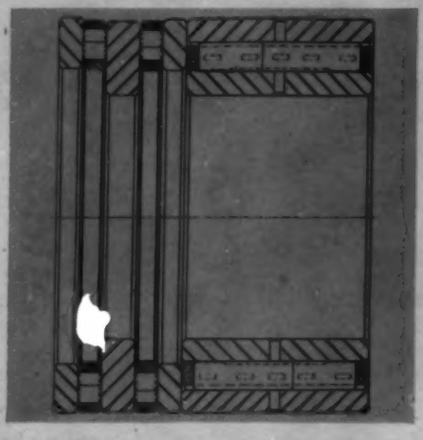
OF BANTAM BEARINGS



4-ROW TAPERED ROLLER BEARINGS, manufactured by Bantam in sizes up to 51" O.D., are especially suitable for such applications as back-up rolls and roll necks on hot and cold strip mills. Bantam Straight Radial Roller Bearings are also extensively used in this type of application.



BANTAM-DESIGNED MILL TYPE BEARINGS combine a radial roller section with a double-direction thrust bearing. Used at one end of roll necks, these bearings provide necessary thrust capacity, permit use of Straight Radial Roller Bearings at opposite end. Bearings of this type are made in three lengths for each bore size, providing a wide capacity range.

METAL FORMING PLANTS find many uses for this 45-ton press brake, built by Verson All-steel Press Company for such applications as straightening armor plate, forming aircraft parts, and producing munitions boxes and other equipment. High-speed flywheel shafts of these machines rotate on Bantam Quill Bearings.

EVERY MAJOR TYPE of anti-friction bearing is included in Bantam's line—straight roller, tapered roller, needle, and ball. With this broad background of experience, Bantam's engineers are well qualified to cooperate in the selection of standard bearings, or design special ones, for every steel mill application. If you have a bearing problem of any kind, TURN TO BANTAM.

BANTAM SERVES THE STEEL INDUSTRY with a wide range of sizes and types of anti-friction bearings engineered for severe service requirements. Typical application of Bantam Bearings is on work rolls and back-up rolls of this continuous hot strip mill in one of the country's major steel plants.

ULTRA-PRECISION IN LARGE BEARINGS made by Bantam is assured by special machining and grinding methods that result in extremely low tolerances, both in dimensions and in concentricity. Hardening techniques developed by Bantam engineers produce unusual toughness and strength, and contribute to successful bearing performance.

BANTAM BEARINGS

STRAIGHT ROLLER · TAPERED ROLLER · NEEDLE · BALL

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Sperry Products Inc., Hoboken, N. J. Testing equipment.	A-306
Standard Oil Co. of Ohio, Cleveland Industrial oils and greases.	D-336
Standard X-Ray Machine Co., Chicago Inspection equipment.	A-429
Stearns-Rogers Mfg. Co., Denver Castings.	B-320
STEEL, Cleveland Publications.	E-143
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Sterling Alloys Inc., Woburn, Mass. Alloy castings.	B-115
Stuart Oil Co. Ltd., D. A.; Chicago Industrial oils and greases.	C-310
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Swift Electric Welder Co., Detroit Butt, spot and projection welders.	A-500

T

Tagliabue Mfg. Co., C. J.; Brooklyn, N. Y. Pyrometers; thermometers; controllers.	S-126
Taylor-Hall Welding Corp., Worcester, Mass. Resistance welders.	A-500
Taylor-Winfield Corp., Warren, O. Electric welders.	A-500
Tel Autograph Corp., New York Communication devices.	C-236
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Thomson-Gibb Electric Welding Co., Lynn, Mass. Resistance welders.	A-500
Tide Water Associated Oil Co., New York Industrial oils and greases.	D-324
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Triplex Machine Tool Corp., New York; Ultra Lap Machine Co., Detroit; City Engineering Co., Hamilton Tool Co., Dayton, O. Automatic screw machines, hobbing machines.	D-310

V

Valley Iron Works, St. Paul Castings.	B-320
Vanadium Corp. of America, New York Vanadium products.	A-510
Vascoloy-Ramet Corp., North Chicago, Ill. Pickling tanks; acid resisting equipment.	A-504
Victor Saw Works Inc., Middletown, N. Y. Saws.	A-328
Vulcan Foundry Co., Oakland, Calif. Castings.	B-320

W

Wall-Colmonoy Corp., Detroit Hard-facing alloys.	B-339
Warren Foundry & Pipe Corp., Phillipsburg, N. J. Castings.	B-320
Welding Engineer Publishing Co., Chicago Publications: *Welding Engineer.*	S-158
Welding Machines Mfg. Co., Detroit Portable gun welding equipment.	A-500
Welding Sales & Engineering Co., Detroit Resistance welders.	A-500
Wellman Co., S. K.; Cleveland Metal friction materials.	E-142
Wells Mfg. Corp., Three Rivers, Mich. Metal band saws.	B-310
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Welding equipment, electrodes; electrical instruments.	B-405
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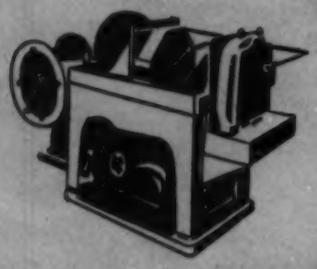

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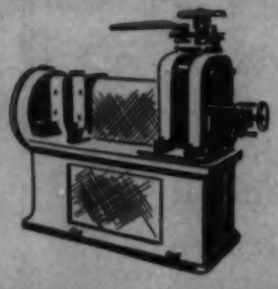

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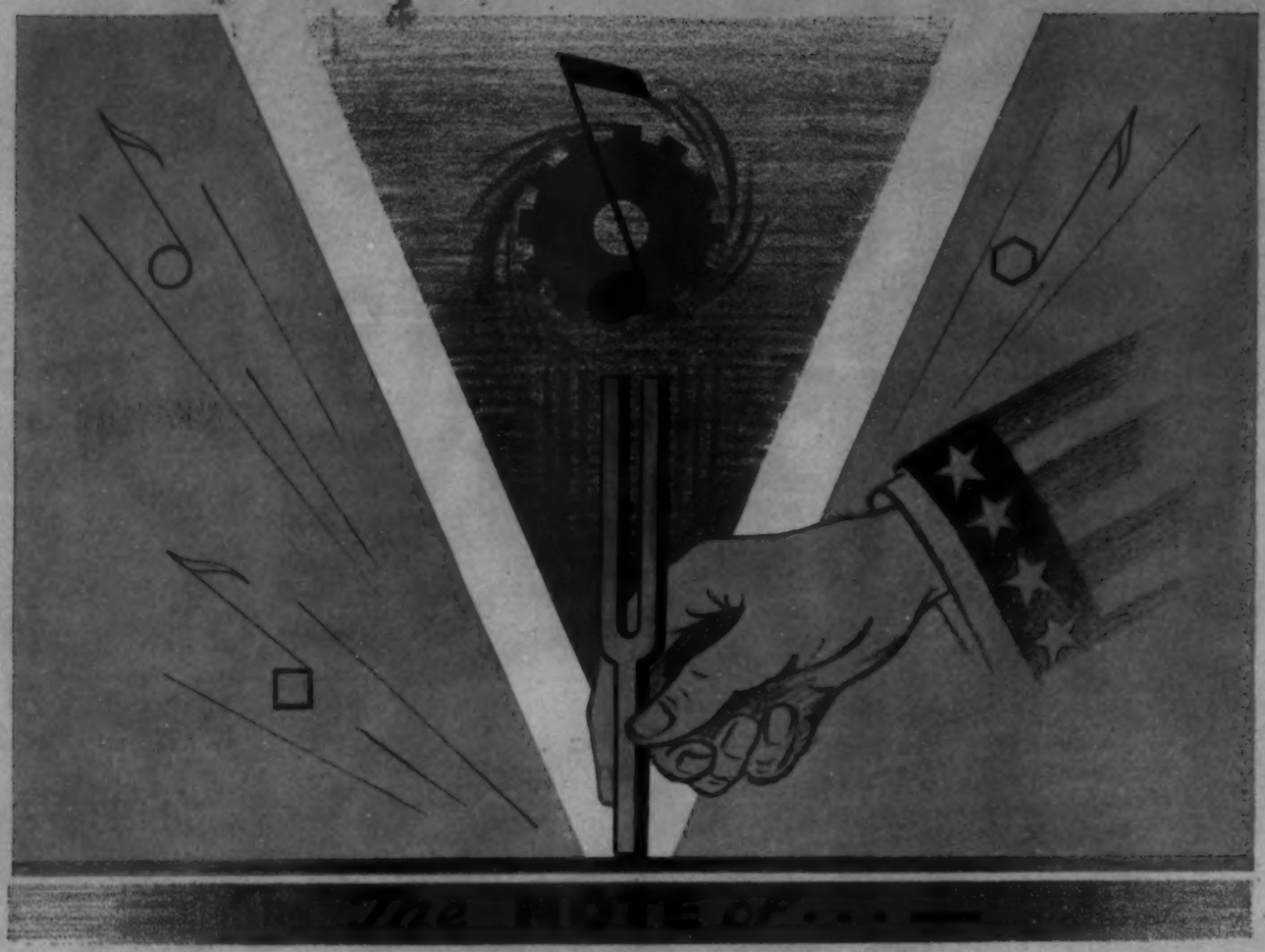

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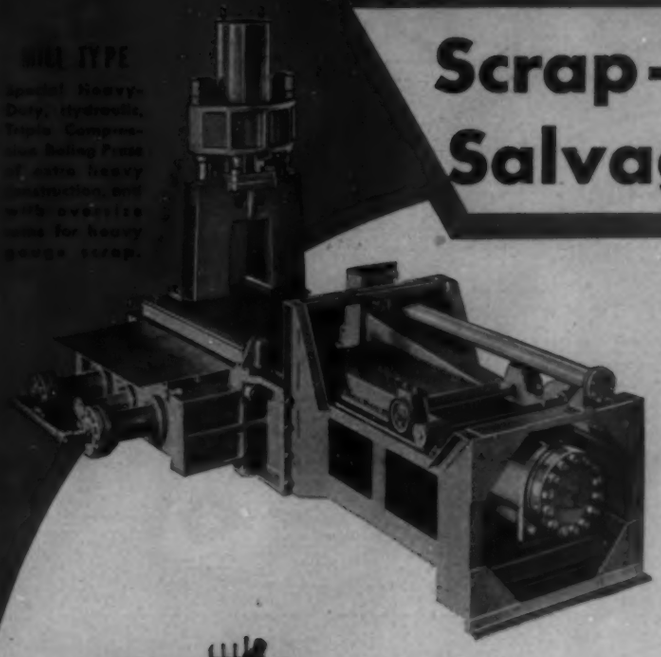

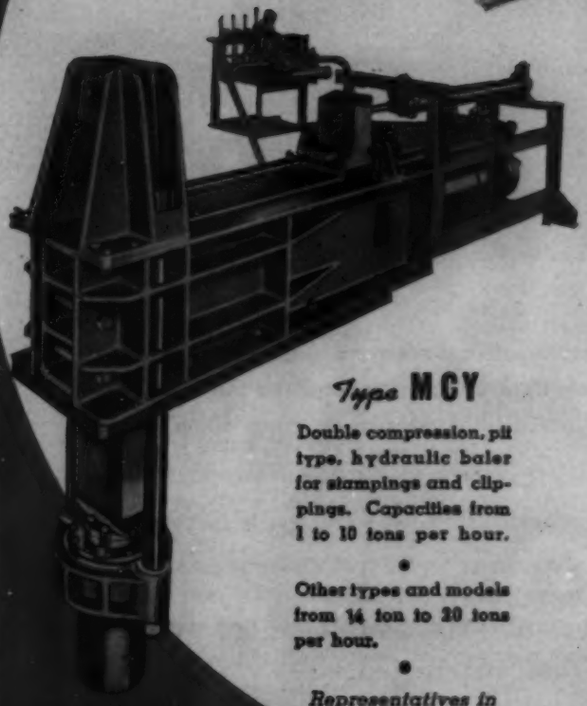

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3. Avoid kinks and sudden jerks . . . . also, avoid cross-winding on drums, and reverse bends if possible.

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5. Use wire rope of the correct size, construction, type and grade for your particular conditions.

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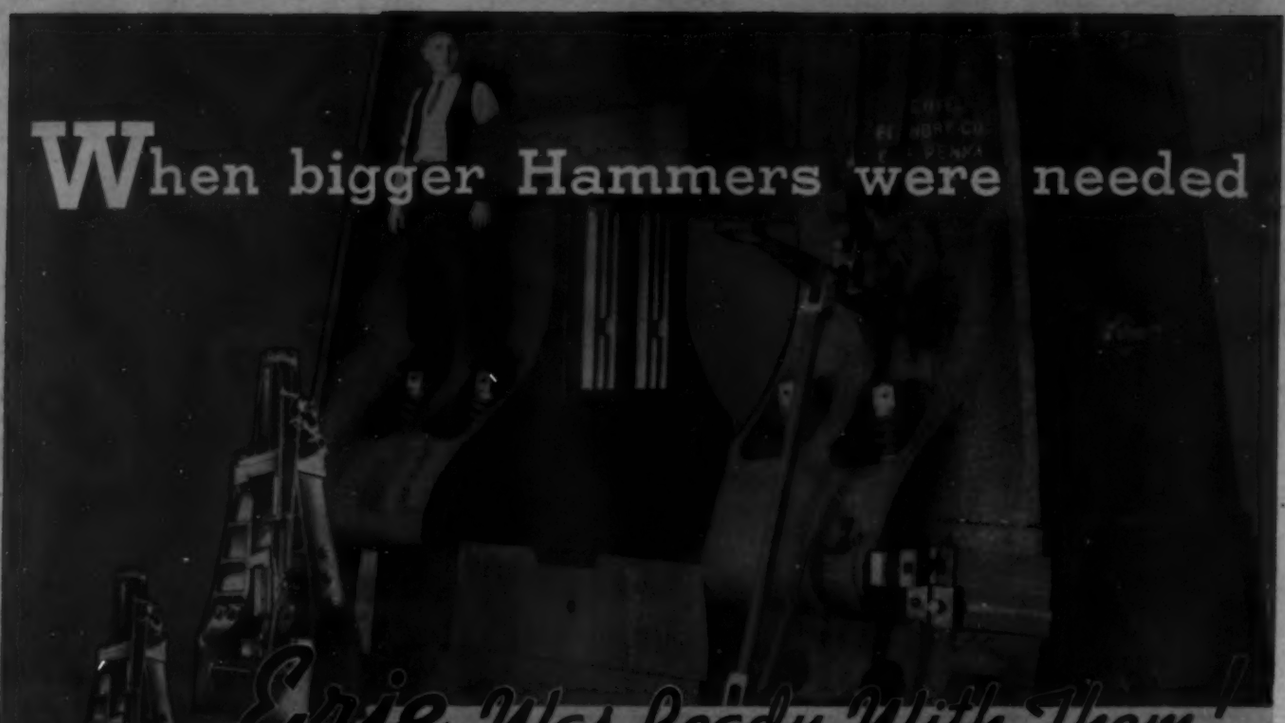
LEBANON *Stainless and Special Alloy* **STEEL CASTINGS**

When bigger Hammers were needed



Erie Was Ready With Them!

BIGGER Planes, Tanks, Guns, Ships demand bigger forgings . . . bigger hammers. By using one piece drop forgings for complete structural sections, previously fabricated by joining many small parts, *production time* and *man-hours* are being reduced . . . Erie Drop Hammers have grown bigger *ahead of the job.* Thus the foresight of Erie Engineers and Craftsmen in stepping up hammer sizes and capacities adds a mighty wallop to assure the successful completion of America's big job in Logistics.

Erie's complete facilities are devoted to war work.

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Throw Your Scrap into the Fight!

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ERIE BUILDS Dependable HAMMERS

"We'll find Chucks that size if they're anywhere in town"

Like hundreds of other plant items, even the best chucks—or anything else for that matter—wear out *some* time.

If new stocks are scarce and your want is immediate, you "need a friend" in a big hurry. *Here he is,* all set to give you the help you need—just call the Representative of your nearby Industrial Supply Distributor. For, even if *he* hasn't any in stock, he is almost sure to know many possible sources that may be closed to you. So when he says "don't worry—we'll scout up an emergency supply for you if there's any in town," you can be sure he will make every effort to keep you going. And usually he will *succeed.*

It's good business to take your own Distributors into your confidence and use them all the time. We know, because for many years they have been *our* Sales Representatives on Cle-Forge High-Speed Drills and Peerless High-Speed Reamers throughout Industrial America.

This incident is typical of the unusual services that many Mill Supply Distributors are rendering their customers during the Emergency.

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To conserve nickel and chromium, all industry is cooperating to limit the use of stainless steels to vital applications where only stainless will do the job. For such applications Copperweld Steel Company is furnishing Aristoloy Stainless steel bars and billets. We'll be glad to discuss your stainless steel applications with your engineering staff.

COPPERWELD STEEL COMPANY **WARREN, OHIO**

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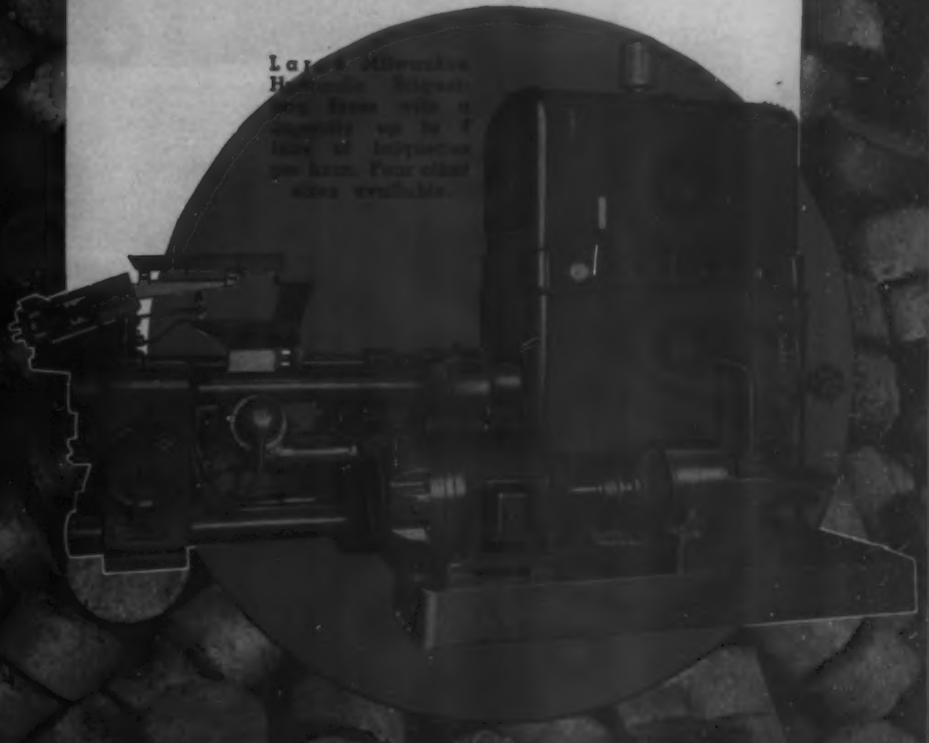
—an Old, Proven Process

14 YEARS AGO, the Milwaukee Foundry Equipment Company designed, built and perfected the first Milwaukee Hydraulic Briquetting Press—a machine for converting borings and turnings into usable form. This original machine is still operating 24 hours of the day. Now, Milwaukee Presses are being used by ALL of the automotive manufacturers and many other of the nation's leading industrial plants.

MILLIONS OF TONS of borings and turnings have been briquetted by Milwaukee Presses. Briquetting is a vital factor in the nation's war effort because it salvages the highest percentage of materials . . . affords better metal control . . . effects substantial savings in melting costs.

Be independent of the scrap market! Install a Milwaukee Hydraulic Briquetting Press. Write for literature.

MILWAUKEE FOUNDRY EQUIPMENT CO.
3218 W. Pierce Street Milwaukee, Wis., U. S. A.



Conserve National Resources!

Help Win the War by BRIQUETTING Metal Scrap!

No substitute or alternative can duplicate NITRIDED NITRALLOY

THERE ARE many applications for which alloys and heat treatments other than Nitrided Nitralloy will meet the technical and economic requirements, but—

where economics and policy require the utmost in surface hardness, core properties, resistance to abrasion and fatigue,

there is no substitute for Nitralloy Steel in the sense that such substitute will give equivalent service. The Nitrided case obtained on standard Nitralloy Steels has properties that cannot be produced in any other way.

• • •

EXCLUSIVE PROPERTIES OF NITRIDED NITRALLOY

1. Extreme surface hardness (Vickers Diamond Brinell 900-1200).

2. Procurement of high hardness with a minimum of distortion.

3. Retention of hardness and abrasion resistance at high temperature (750° F.).

4. Resistance to softening by heating to as high a temperature as 1200° F.

5. Resistance to corrosion by weather.

6. Unequalled abrasive resistance in wear against itself or other material, including grit, sand, mud, etc., under certain conditions, in the absence of lubrication.

7. Availability! Nitralloy Steel is manufactured by many steel companies. They are listed on this page.

Only NITRALLOY will do what NITRALLOY does.

For booklets containing complete technical details, write us or any licensee.

THE NITRALLOY CORPORATION

230 PARK AVENUE — **NEW YORK, N. Y.**

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ALLEGHENY LUDLUM STEEL CORP. ..... WATERVLIET, N. Y.
BETHLEHEM STEEL CO. ..... BETHLEHEM, PA.
COPPERWELD STEEL CO. ..... WARREN, O.
CRUCIBLE STEEL CO. OF AMERICA, NEW YORK, N.Y.
FIRTH-STERLING STEEL CO. ..... McKEESPORT, PA.
REPUBLIC STEEL CORPORATION ... CLEVELAND, O.
THE TIMKEN ROLLER BEARING CO. .. CANTON, O
ROTARY ELECTRIC STEEL CO. ..... DETROIT, MICH.
VANADIUM-ALLOYS STEEL CO. ... PITTSBURGH, PA.
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LINK-BELT CO. ..... PHILADELPHIA, PA.
MET-LAB, INC. ..... PHILADELPHIA, PA.
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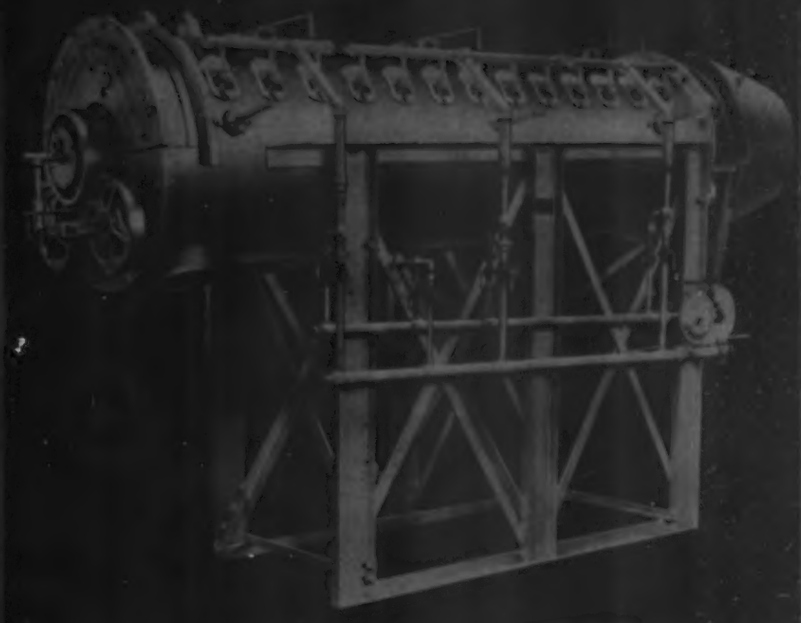
WARMAN STEEL CASTING CO., LOS ANGELES, CAL.

E3011

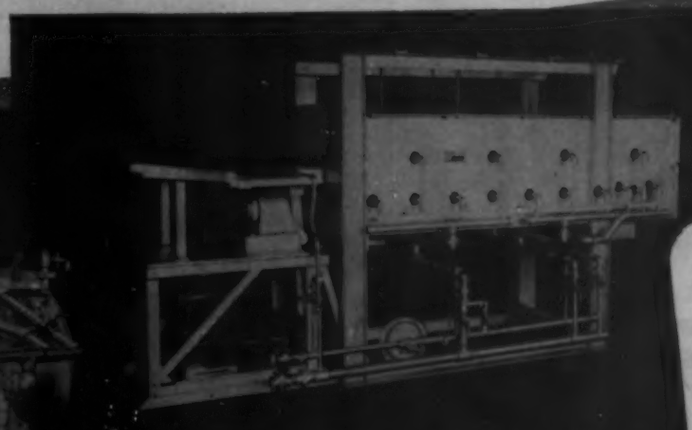


The "A. G. F." way is the modern way to heat treat

"A.G.F." experience covering more than half a century is ready to help you meet and solve any heat treating problems which are involved in war production.

"A.G.F." engineers are competent to advise you on your needs because they have pioneered many of the developments in industrial heating. The first air blast melter, the first rotary retort machine, the first to originate the gas carburizing process as well as the nitrogenizing (nitriding) process with equipment for its use—"American" engineers have always led the way.

"A.G.F." Heat Treating equipment is modern, operates on a minimum of fuel, produces uniformly satisfactory work, is easily controlled and is available for practically all heat treating purposes.



"A. G. F." OFFERS

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- Conveyor Heating Machines
- Open Flame Heating Machines
- Rotary Tempering Machines
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If your problem involves getting more and better work in shorter time—consult "A.G.F." Write, giving details, so that we can make a proper recommendation.

AMERICAN GAS FURNACE CO.

Elizabeth, New Jersey

FOR "LIGHT CASE" WORK
USE **PARK**

C. H. C. SALT M. P. 1100°—W. R. 1600°F. For intermittent bath or low "drag out" operation. Approx. 75% cyanide.

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KLEAN HEAT SALT M. P. 1160°—W. R. 1600°F. For "skin" hardening and reheat bath for carburized work. Approx. 30% cyanide.

PARK KASE #3 SALT M. P. 1050—W. R. 1700°F. An activated cyanide bath with incorporated carbon cover. Best suited for shallow "cases" up to .015", or reheat bath. Non-fuming and soluble after quench.

PARK KASE #5 SALT M. P. 1200—W. R. 1700°F. Activated cyanide base salt. Very water soluble. For cases up to .010".

PARK KASE #6 SALT M. P. 1150—W. R. 1700°F. Activated cyanide base salt for "skin" hardness work.

FOR "HEAVY CASE" WORK
USE **PARK**

PARK KASE #1 SALT M. P. 1100°F—W. R. 1700°F. An activated cyanide base salt for case depths up to .125", has incorporated carbon cover. Recommended for deep "case" work and long heating cycles. Cleans satisfactorily on quench.

PARK KASE #2 SALT M. P. 1040—W. R. 1700°F. Similar to PK_1 and will give case depths up to .050". Has incorporated carbon cover. Cleans easily. Non-fuming.

PARK KASE ENERGIZER SALT A specially formulated cyanide energizer for addition to PK_1 or PK_2 baths, to maintain bath concentration for work with low "drag out."

PARK KASE CARBON A special carbon cover for addition to all types of "casing" baths to prevent fuming and reduce radiation losses.

PARK NO CARB A product applied to prevent carburization or decarburization.

Heat Treating **Park** Products since 1911

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PRESSURE VESSELS
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GENERAL AMERICAN

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G. A. for Other Services, Too . . .

The Plate & Welding Division is but one activity of General American Transportation Corporation. You may have occasion to use other services of this organization; they are listed here for your information.

THE GATX FLEET—world's largest privately owned fleet of special cars—tank, refrigerator, milk, stock, refrigerator express—available by trip, day or year.

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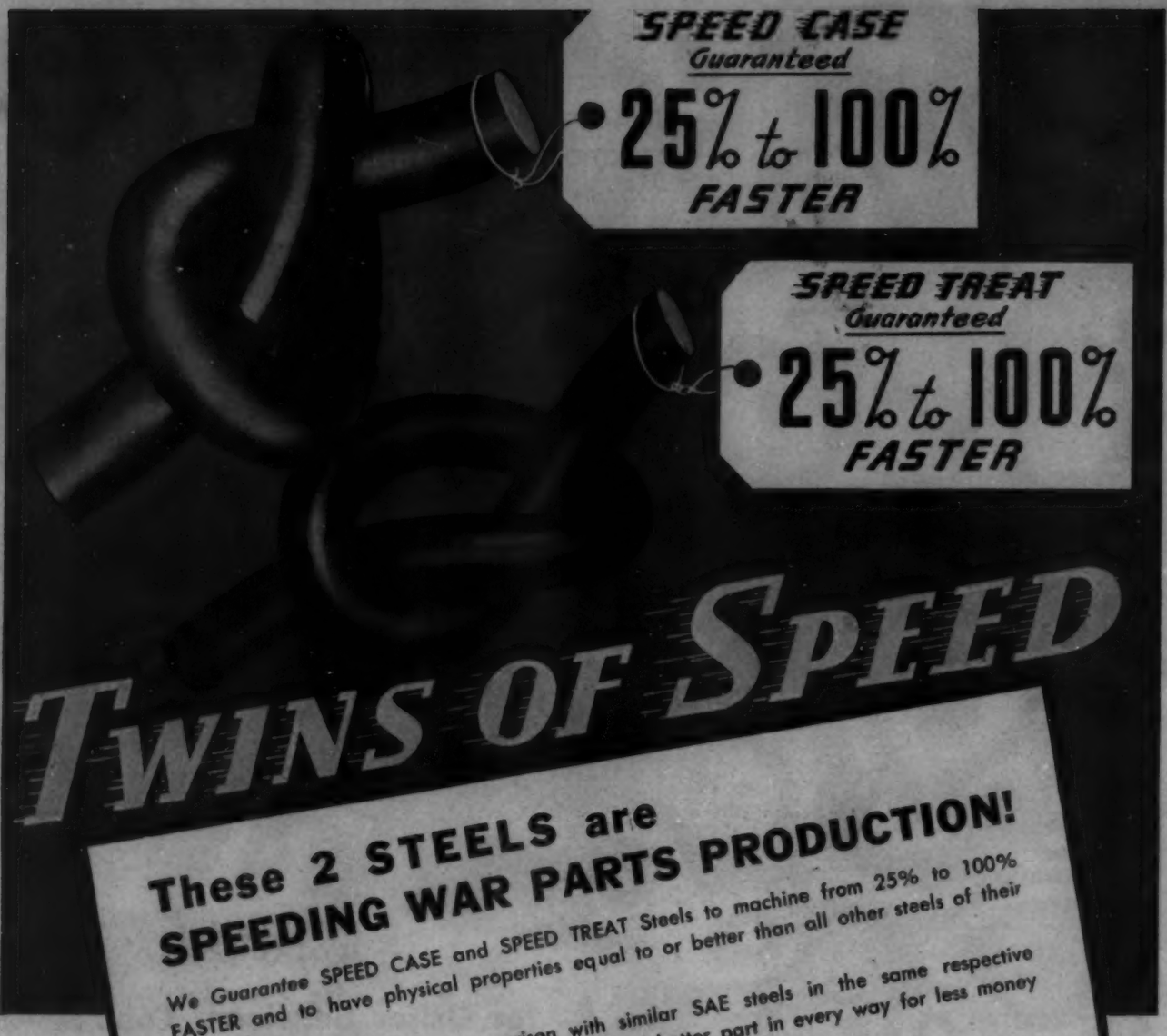


SPEED CASE
Guaranteed
• 25% to 100%
FASTER

SPEED TREAT
Guaranteed
• 25% to 100%
FASTER

TWINS OF SPEED

These 2 STEELS are SPEEDING WAR PARTS PRODUCTION!

We Guarantee SPEED CASE and SPEED TREAT Steels to machine from 25% to 100% FASTER and to have physical properties equal to or better than all other steels of their class.

We also guarantee that in comparison with similar SAE steels in the same respective carbon ranges you can produce a stronger and better part in every way for less money and with increased tool life.

AVERAGE PHYSICAL PROPERTIES COLD DRAWN STEELS BASED 1" ROUND

	Surface ft. Per Min.	Machinability %	Tensile Lbs.	Yield Lbs.	Elong. in 2" %	Red. Area %
X-1515 SPEED CASE	190-250	125	85,000	75,000	20	48
SPEED TREAT X-1545	140	90	110,000	83,000	13	30

MONARCH STEEL COMPANY

HAMMOND INDIANAPOLIS CHICAGO

Sole Licensee for Eastern States

THE FITZSIMONS COMPANY

YOUNGSTOWN, OHIO

MANUFACTURERS OF COLD DRAWN CARBON AND ALLOY STEEL BARS

"STANDARD EQUIPMENT" IN PEACE IS ONE THING

BUT TODAY, almost before a test pilot can take a new fighter plane "upstairs," its design is changed. Faster engines are constantly being demanded — and delivered . . . tougher fabricating materials developed.

Yet the warplane whose wings are still blueprint paper has one thing in common with aircraft designs that have gone before — the Torrington Needle Bearing.

Changed-over to production-for-war, the Needle Bearing is once more proving its adaptability, in applications where its unique advantages mean more than ever. Low coefficient of friction, for example, makes it especially well-suited to manual control operations in fighter planes, assuring smooth, steady performance.

Not only in aircraft production but throughout industry, every feature of the Needle Bearing is filling some vital wartime need. Its small size is saving space and critical materials . . . its remarkable ease of installation cutting assembly time, its design eliminating extra parts and assembly steps, its high capacity and efficient lubrication reducing the need for replacement or maintenance attention in service.

Small wonder that the Torrington Needle Bearing has become standard equipment, too, in America's production-for-Victory program.

***FOR INFORMATION** concerning capacities and sizes, send for Catalog No. 110. Or consult a Torrington engineer. He is well qualified in adapting the Needle Bearing's unique advantages to specific problems.*

THE TORRINGTON COMPANY
TORRINGTON, CONN., U. S. A. • *Est. 1866*
Makers of Needle and Ball Bearings
New York Boston Philadelphia Detroit
Cleveland Seattle Chicago Los Angeles
San Francisco Toronto London, England

TORRINGTON NEEDLE BEARING

Every feature fills a wartime need

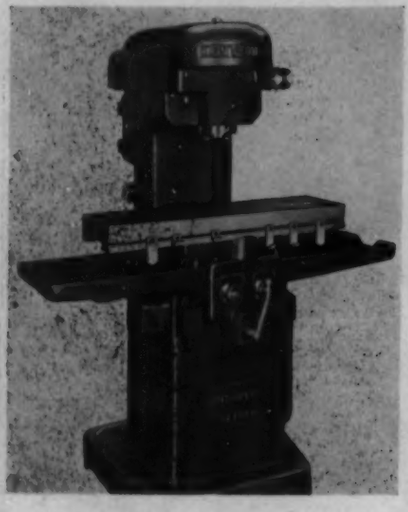
INDUSTRIAL EQUIPMENT

Vertical Miller

Kent-Owens Machine Co., Toledo, O., announces a No. 1-14V vertical milling machine designed for performing rapidly vertical milling operations on small parts. Instrumental in the rapid operations is its infinitely adjustable hydraulic table feed with full automatic cycle.

Table movements are controlled by a lever which indicates the direction of movement. Graduated dials provide any feed rate within the entire range of 1 to 40 inches per minute. The table has a feed in both directions, rapid traverse in both directions, automatic shift from rapid traverse to feed in either direction and automatic reverse at both ends of the stroke.

A floor type unit, the machine features a box-type bed completely enclosing the motor and hydraulic pump unit for actuating the table. Both the spindle



head and the head carriage are one-piece castings. The spindle head has cross adjustments. It moves in long narrow ways in the head carriage. The head carriage is adjustable vertically on two cylindrical steel posts by a screw with micrometer dial.

Ten spindle speeds ranging from 115 to 300 revolutions per minute are available. Spindle drive is by V-belts from a foot-mounted motor mounted on the rear of the spindle head. The miller can be equipped with either a one or two-way positive stop with dwell.

Magnetic Separator

Stearns Magnetic Mfg. Co., Milwaukee, announces a new laboratory magnetic separator for analyzing and determining the best method of concentrating, purifying or separating various materials in small capacities or for sample testing.

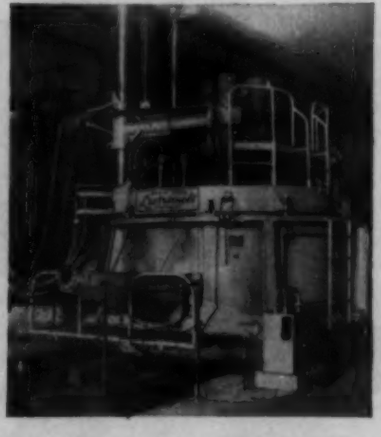
Units, such as the one illustrated, feature a steel inductively magnetized revolving take-off ring employed to carry the magnetic material beyond the conveyor belt to final delivery. Two mag-

netic and one nonmagnetic product can be produced with this machine and the regulation size unit can be designed to produce four or more magnetic products, depending on requirements.

Provision also is made for adjusting the separator while in operation. This applies not only to the magnetic air gap, but also to the flux density of the magnets. This laboratory type D is particularly suitable for handling material of feebly magnetic properties. The separator occupies a floor space of 2 feet, 9 inches by 1 foot, 5 inches and is 2 feet, 6 inches high.

Electric Furnace

Pittsburgh Lectromelt Furnace Corp., 119 Thirty-second street, Pittsburgh, announces design changes in a number of its smaller size electric furnaces to handle the peculiar type of lighter scrap now



being turned into the steel mills more efficiently.

Principal change is in the elongation of side plates to increase volmetric scrap capacity, and maintain rated capacity of heats. A typical example of the change in design is in the 10-ton furnace shown.

Here side walls were deepened to allow an increase of 25 per cent in scrap capacity. The scrap capacity of 2 to 5-ton furnaces has been increased approximately 22 per cent. Side walls, including refractory linings average 13½ inches in thickness. Furnaces are cylindrical in shape with spheroidal bottoms.

Barrel Grab

J-B Engineering Sales Co., New Haven, Conn., has developed a barrel grab capable of handling open wooden barrels without crushing them. It was designed especially for a company making munitions, to meet the problem of handling partially filled barrels as shown in the

accompanying illustration, putting them on the scale to be weighed. In order that the contents might be inspected, the barrel head was left out. The grab not only lifts the barrels but remains open after the barrel had been put down, to permit quick operation.

Lighting Fixture

General Electric Co., Nela Park, Cleveland, announces development of a Jumbo luminaire, claimed the biggest and most powerful lighting fixture made. It consumes 4600 watts and produces nearly 150,000 lumens of light and employs both the new Mazda 3000-watt mercury tubular lamp and a battery of eight 200-watt inside-frosted filament lamps.

Besides producing illumination for large working areas, the luminaire is fabricated of special fiber board and a bottom consisting of ordinary tracing paper so sealed to the unit as to keep out dust and dirt; saving critical metals commonly used in industrial fixtures.

The unit measures approximately 8

Tanks are Forgings

Tough, stress resistant forgings — parts that must withstand the most grueling punishment and service abuse — are essential in large quantities for the light, medium and heavy tanks now in production.

Because of the wider use of forgings, American-made tanks excel. They are faster, superior fighters, better able to withstand and "dish-out" blitz warfare.

Beating plow-shares into swords, making forgings for tank transmissions, engines, crawlers, guns and other operating parts is our daily job.

Ever more rough and finished parts of this type flow from under our hammers as the tempo of war production in our shops increases.

While our facilities today are heavily taxed, we still have the desire and the ability to serve more builders of tanks, ships, planes, guns, machine tools and ordnance.

A quick termination of totalitarian ambitions will speed the day when free men can follow normal pursuits. We are doing our part to help speed that day.

Proudly we fly the Navy "E" flag awarded for excellence and proficiency in the production of Naval Materiel.

KROPP FORGE COMPANY

Makers of Drop, Upset and Hammer Forgings for Guns, Planes, Tanks, Ships, Ordnance and Machine Tools

"World's Largest Job Forging Shop"

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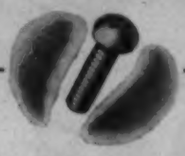
Now You Have

19 SOURCES OF SUPPLY FOR PHILLIPS RECESSED HEAD SCREWS



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Your screw requirements can be met without delay — with genuine fast-starting, quick-driving, tight-seating Phillips Recessed Head Screws.

WHAT ABOUT DRIVERS? There are 44 sources of supply for PHILLIPS DRIVERS plus hardware and mill supply distribution.

PHILLIPS RECESSED HEAD SCREWS

GIVE YOU 2 for 1

(SPEED AT LOWER COST)

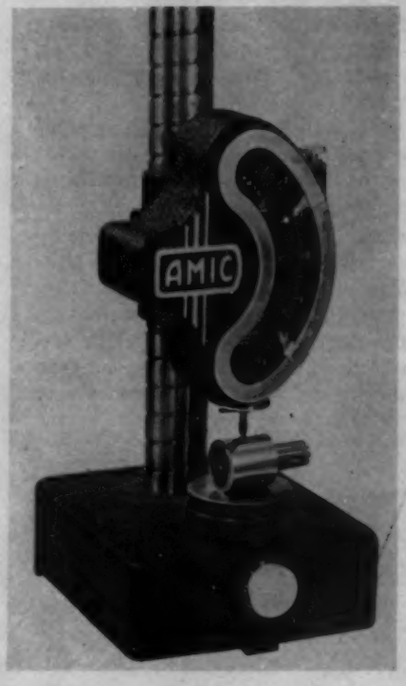
WOOD SCREWS · MACHINE SCREWS · SHEET METAL SCREWS · STOVE BOLTS
SPECIAL THREAD-CUTTING SCREWS : SCREWS WITH LOCK WASHERS

feet in length, 4 feet in width and two feet in depth. The combination of mercury and filament lamps provides a quality of light designed to eliminate reflected glare from such shiny surfaces as polished sheet aluminum and other materials used in construction of war goods.

Comparator

American Measuring Instruments Corp., 40 West Twenty-second street, New York, is offering a new type comparator for accurate checking of large and small lots. It has a working height capacity up to 12 inches, a throat depth of 4 inches and a working circle, by swiveling the head, of 10 inches.

The instrument is mounted on a



heavy accurately machined square cast-iron base into which is built a parallel ground and lapped table. Latter has a vertical micrometer adjustment for setting the comparator to zero position by means of a master gage or Johanson block.

Magnification provided is 1:1000. 0.001-inch displacement of the measuring pin causes the hand to move one full inch on the 6-inch dial. Each inch on the dial is subdivided into ten lines, each division indicating 0.0001-inch. Deviations as small as 0.00002-inch can be detected with ease. Total capacity is plus or minus 0.003-inch.

Feature of the unit is a disk mounted on the axis of the indicator hand rotating in a permanent magnetic field which brings the hand to immediate rest. A

INCREASE PRODUCTION, CUT YOUR COSTS WITH CLEVELAND *Single Spindle* AUTOMATICS AS THEY DO AT THE HEIL COMPANY PLANTS

• After investigating the possibilities of Cleveland *Single Spindle* Automatics, The Heil Company decided to produce a part in quantities of 5,000 to 10,000 pieces on a 2½-inch capacity Model A Cleveland. It had previously been produced by other methods. • As forecast by our engineers and time-study men before installation of the Cleveland Model A, costs immediately dropped to a pre-determined point, and stayed there. Production increased. Five operations are performed on this part. "Very satisfactory; operation is perfect up to date," says the company. • A Bulletin describing the size Cleveland Model A you might require will be sent on request.

THE CLEVELAND AUTOMATIC MACHINE COMPANY
2269 ASHLAND ROAD, CLEVELAND, OHIO

Sales Offices at

Chicago, 565 W. Washington Street • *Detroit*, 540 New Center Bldg.
Newark, 702 American Insurance Bldg. • *Cincinnati*, 507 American Bldg.

CLEVELAND *Single Spindle* AUTOMATICS

RAPID progress is being made in the design and construction of cranes and hoists and in their more efficient application to present important material handling jobs. More than ever before producers of equipment must also be material handling experts.

This trend is reflected in the Euclid Hoist Catalog. Various hoists are illustrated, their particular characteristics described and efficient applications of each are pictured and explained.

Reference is also made to Euclid's experience in combining standard units into uncommon assemblies to meet unusual or particularly difficult material handling and moving jobs.

Whether in the market now or not you should have a copy of this hoist catalog. The Euclid Crane Catalog will also be sent if you are interested. Write today.

GET your Copy NOW

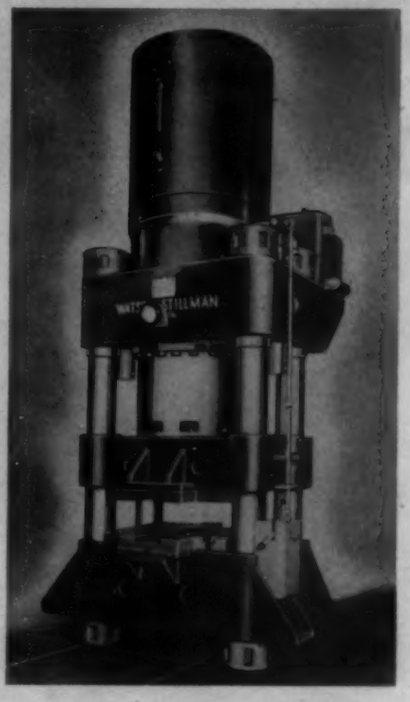
EUCLID CRANES & HOISTS

THE EUCLID CRANE & HOIST CO.
Chardon Rd., Euclid, Ohio

lever on the outside of the housing permits lifting measuring pin before insertion of piece to be measured, eliminating shocks. For additional convenience in final setting a zero adjustment of the dial is provided.

Forming Press

Watson-Stillman Co., Roselle, N. J., announces a new 1300-ton forming press which can be automatically or manually operated. It is an entirely self-contained unit including a 50-horsepower motor and



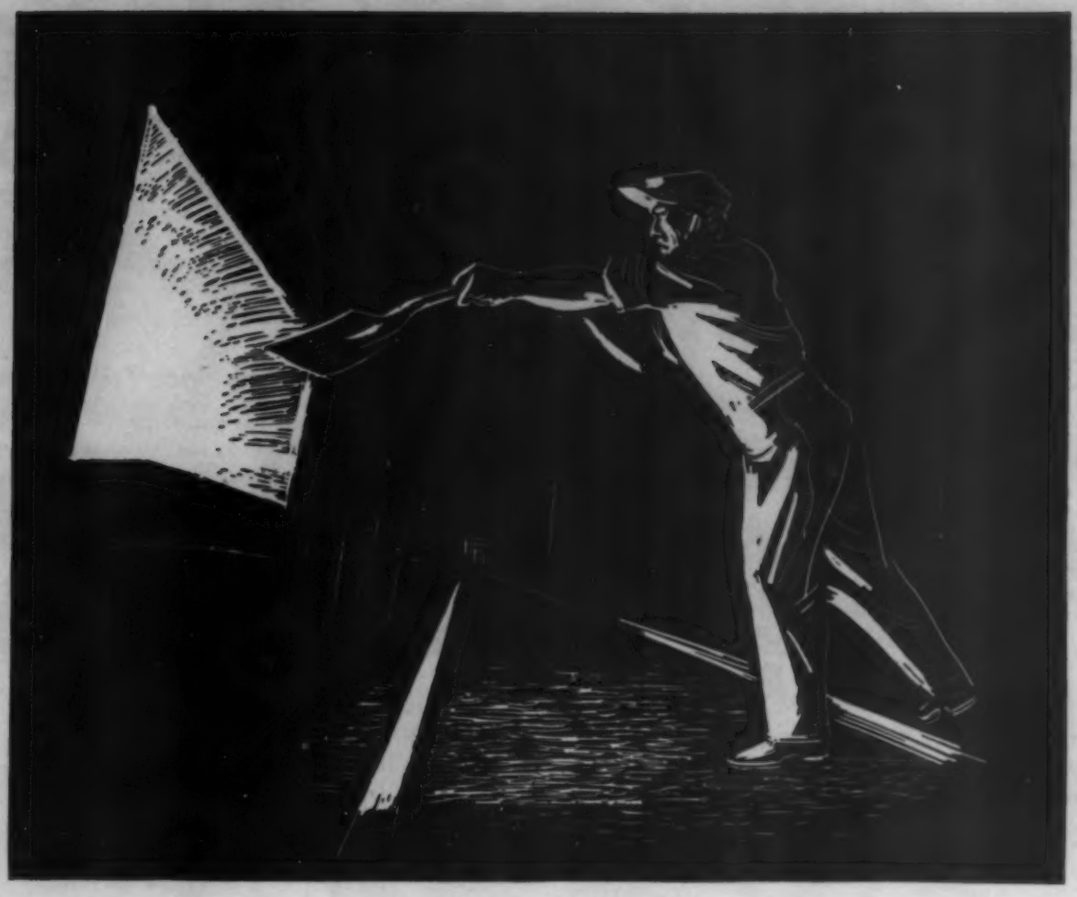
radial piston pump delivering 45 gallons per minute.

The press is of the vertical 4-column type. Its 35-inch diameter ram exerts a pressure of 2750 pounds per square inch with a 22-inch stroke. Advance and return speeds are 650 inches per minute, with a pressing speed of 10.5 inches per minute. Press is controlled by a lever latch-operated by a pressure cylinder.

Tool Holders

Empire Tool Co., Detroit, announces six new tool holders for accommodating Luers patented cutting-off blades on six additional types of screw machines. These broaden the use of the blades to include their adaptability on the following makes of machines: Greenlee 4 and 6 spindle automatics, New Britain automatics, all lathe and hand screw machines with round posts, Acme-Gridley R and RA series, and Gridley models F and G multiple spindle automatics.

One of the features of the holders is the simplicity with which a cutting-off tool can be set up in the machine and



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facility with which an operator can remove the blade for resharpening and later replace it precisely in the original position without disturbing the set-up.

The blade is held in place rigidly by two cams which force the top surface of the blade against the ground surface of the holder and provide a solid bearing. An arrangement on the locking wrench serves as a blade-setting gage and provides means for resetting accurately the blade after resharpening.

One-Piece Tri-Square

Jansson Gage Co., 19208 Glendale, Detroit, has introduced a one-piece solid master tri-square for extreme precision measurements wherever 90 degree angles are involved. Held to limits of 0.00002-inch base and side, it is being offered in two sizes: Four inches in

height with a ⅝-inch standing base and 6 inches with a 1-inch wide base.

Of alloy tool steel, the tri-square is provided with an insert hard fiber serrated grip to prevent heat transference and to prevent slipping in handling which might cause damage to unit. Vertical side edge is knife-sharp for truer visual gaging.

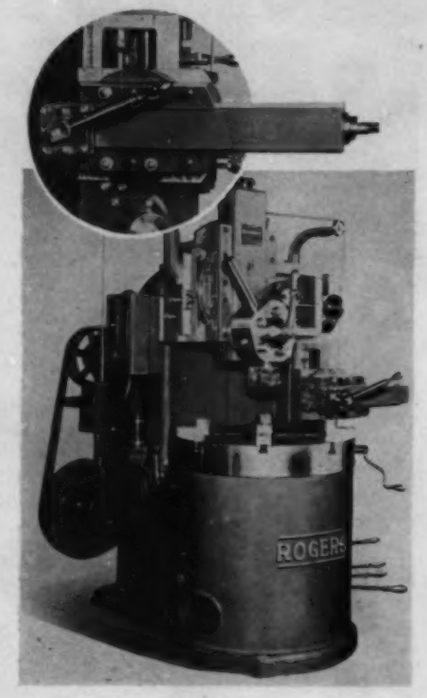
Vertical Turret Mill

Rogers Machine Works Inc., has put on the market a 36-inch vertical turret machine for boring, turning and drilling ferrous and nonferrous castings, forgings, etc. to close limits under production conditions. Side head and main turret slides are swivel-mounted to expedite machin-

ing of angular peripheries or bores.

The side head—swivel mounting of which is shown clearly in the enlarged supplementary illustration presented herewith—can be set to any angle up to 35 degrees either side of horizontal. The main turret slide can be set at any angle up to 30 degrees either side of the vertical.

Built-in graduated dials make these settings quick and easy, thus expediting repetitive work. Main turret has five positions, with holes for clamping plain round shanks 2½ inches in diameter. Maximum distance from turret face to top of 4-inch thick plain table is 24



inches. Side head carries a 4⅝-inch square turret with eight clamp screws.

Standard tool holders on main turret and side head turret are designed to hold 1-inch square tool bits. Machine has motor-driven rapid traverse, heavy duty main clutching being enclosed in oiltight casing. Control levers are arranged at convenient position for foot operation, as indicated in illustration.

Table level horizontal chuck permits quick easy sliding of work into position. Main and side heads have eight vertical and horizontal feeds each. Spindle also has eight speeds. Screw cutting attachment is available as an extra.

Welding Electrode

Wilson Welder & Metals Co. Inc., New York, N. Y., has placed on the market a new No. 530 electrode for all-position welding of mild steel with alternating-current welding machines.

Complying with all requirements of the American Welding Society, it is being offered in the following diameters:

meet the Demand
for INCREASED PRODUCTION
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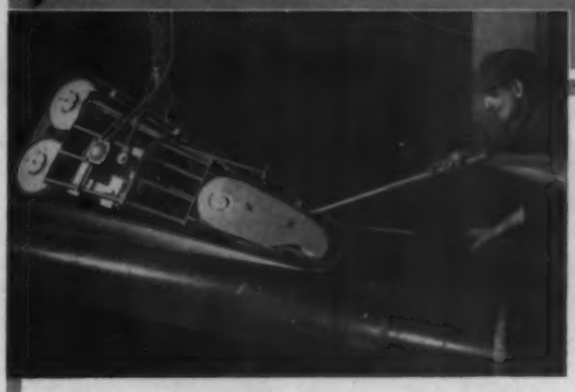

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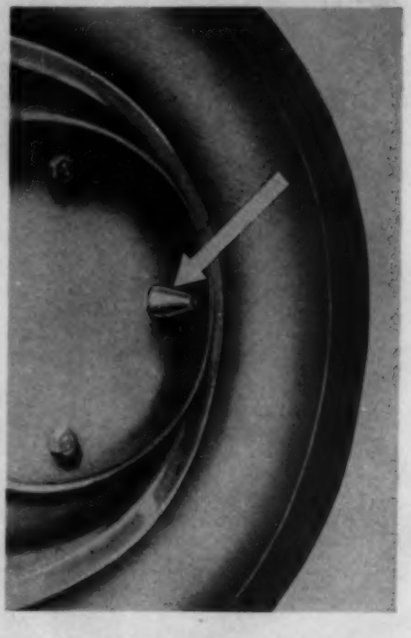
1/16, 3/32, ⅛ and 5/32. Ultimate tensile strength of the electrode as welded is 70,000-75,000—stress relieved, 65,000-70,000. Its per cent elongation in 2 inches is 25 to 30 per cent—stress relieved it is 30 to 35 per cent.

An outstanding characteristic of this electrode is that average operators have no difficulty in securing good fusion and complete penetration it is reported.

Truck Wheel Lock

Streeter-Amet Co., 4103 Ravenswood avenue, Chicago, is offering a new lock for truck wheels, called Lok-On-Nut, designed to discourage tire theft. It is so small it does not disturb wheel balance,



and is of a shape that won't permit any known tool to get a grip on it. The lock is installed by replacing one lug nut or bolt with a Lok-On. Only the person with the "cap" part of the lock can take it off. For maximum protection it is designed in many different combinations.

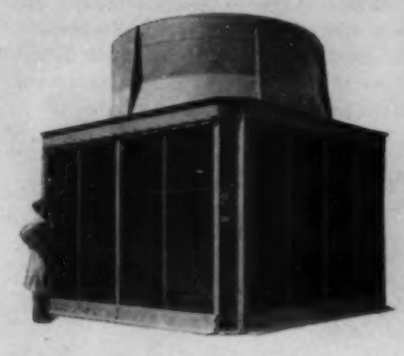
Cooling Machine

Young Radiator Co., Racine, Wis., announces a quad cooling machine for internal combustion engines and compressor cooling or process plants. It resembles in its general appearance a tower extending into the air some 14 feet and measuring about its base approximately 12 feet square.

The name "Quad" indicates arrangement of the cooling unit since it is formed into a four sided assembly, sides of which are comprised of heat transfer surfaces for water oil or gas cooling and for steam or vapor condensing as required. A high capacity induced draft fan is mounted horizontally at the top of the

tower drawing air through the heat transfer elements and discharging it upward through an aero-dynamically designed discharge stack.

This arrangement is said to make it possible to cool a diesel engine of approximately 2000-horsepower capacity handling both the engine jacket water



and lubricating oil, cooling load at a horsepower expenditure of under 25 horsepower.

One feature of design is the method of sub-assembly employed whereby component side members are individually assembled and supported for ease of handling, the entire unit being erected at the point of operation with the various sides bolted into their respective positions.

Precision Balances

Roller-Smith Co., Bethlehem, Pa., announces two new types of precision balances for use by unskilled or semiskilled workers. These, available in various sizes for weights ranging from less than

3 milligrams to more than 50 grams, are modified designs of the model B balance.

In these new designs the model B-1 is offered in double-hook type only while the model MB can be furnished in single hook or double hook types. The only other difference between the two is that the MB balance is provided with a weighing chamber to protect the hook and

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STAINLESS-CLAD STEEL

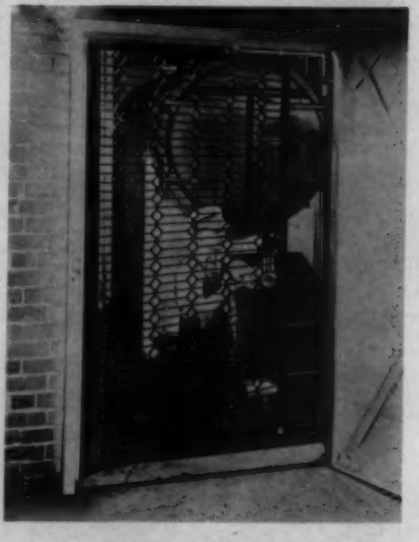
weighing sample from drafts.

In the single-hook balance, the material to be weighed is hung on the hook and the index lever moved until the parallex pointer fastened to the beam indicates zero. The index pointer attached to the index lever then indicates the weight of the object. Double-hook balances operate in the same manner except that the second hook is provided so counter-weights can be used to increase the capacity of the balance to a maximum of three times normal.

Protective Grille

Kinnear Mfg. Co., Columbus, O., announces a new swinging-type grille for protection of doorways. It barricades doorways without obstructing air, light or vision.

The grille is assembled in a heavy steel frame and is equipped with steel encased cylinder lock. It is permanently



installed by massive side hinges. The assembly of steel links and 5/16-inch steel rounds gives neat appearance as well as strength.

Apertures are small enough to prevent admittance of a man's hand and yet large enough to allow maximum passage of air and light and permit vision the full extent of the opening. It is furnished in any size and is of a design suited to any style building or structure

Thumb Spray Attachment

Pyrene Mfg. Co., Newark, N. J., has placed on the market a thumb spray attachment for converting present extinguisher equipment to wartime needs It clamps over the ⅝-inch hose and nozzle of any standard soda-acid, foam, gas cartridge or pump tank fire extinguisher.

Unit is a permanent attachment of spring steel with a deflector edge which influences the range and distribution of

the spray for maximum effectiveness. It acts as a constant reminder to the operator to use a spray on certain industrial fires which can be approached within 6 or 8 feet or to speed the burning and disposal of a magnesium bomb. Solid stream of the extinguisher is converted into a spray by applying pressure with the thumb at the end of the attachment. Conversion takes place only after the liquid leaves the nozzle, and extinguisher itself is not affected.

Safety Clothing

American Optical Co., Southbridge, Mass., announces a new line of welders' safety clothing to protect welders against painful and dangerous exposure to molten metal sparks. The clothing is scientifically built. It is of as few pieces of leather as possible thus eliminating unnecessary piecing out and useless seams.

Fire-resisting duck is used for backing. Gloves and mittens are fleece-lined. All seams are double cotton stitched and

reinforced with metal stitching. The coats and cape sleeves have flat seams to prevent irritation.

In areas of extra tension and strain, reinforcing rivets provide added strength and longer garment life. The garments are equipped with durable snap fasteners. Closely spaced rivets reinforce the pants and overalls from the inseam of the leg to the fly, strengthening the first area in which all trousers usually give way. To prevent sparks from rolling through, the fly has ample over-lap and plenty of snaps placed close together.

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A.R.P. for the Factory

(*Continued from Page 128*)

work to be done by the more active part-time and full-time A.R.P. men. Their job is the protection of the actual factory premises against damage either from bombs, gas or fire. As incendiary dropping has been the main feature of every blitz, fire-fighting has been emphasized. Adequate fire-protection is regarded by the government as so important that many months ago special legislation was introduced to make full-time fire-watching of business and factory premises a compulsory matter. Under this legislation all business and industrial buildings have to be guarded night and day by at least three fire-watchers, but of course in large factories many more watchers are required to insure adequate care.

Fighters Called When Needed

The factory fire-watching system (which also can incorporate the task of roof-spotting for hostile aircraft) works best on the following lines, which have been recommended by Lieut. Col. Guy Symonds, fire advisor to the Ministry of Home Security: "To leave the maximum number of people undisturbed at their work or asleep until they are needed, a single watcher should be on duty either at all times or when an 'alert' is received. Signal bells or a runner enable the watcher to summon supplementary watchers to oversee the whole premises in the event the 'imminent danger' signal is received. Provided fire-watching parties are able to dress on the 'alert' there is no reason why they should not go to bed and sleep in comfort during most of their spells of duty. As an aid to fire-fighting parties, every firm should exhibit and illuminate just inside the front door (preferably on each floor) the following notice:

The Blank and Blankety Blank Co.
Floors—Four
Roof—Made of slates, not proof against incendiary bombs. No concealed roof space.
Gas—Control in basement below this point.
Electric—Control switches in messenger box in this hall.
Special Risks—None at all.
Fire Defense—Sprinklered throughout, stop valve inside back entrance, hydrants 1½-inch hose on all landings, two stirrup hand pumps and four buckets on all landings, 20 gallons water and 10 sandbags top floor.
Auxiliary Lighting—Two hurricane lamps at all hydrant posts.
Nearest Fire Station—In . . . Street

"Under the Normal Minimum Stand-

ards for Trade and Industry Order of the Ministry of Home Security, details are given of the number of power-driven pumps required for a factory. The list is calculated on the basis of total floor area plus floor area where combustible materials are stored, the height above ground level of such floors and the class of building This calculation would not demand even one pump for anything but a works of considerable size, but it also gives the flow in gallons per minute required as a supplementary water supply. It is essential that every works should do what it can to provide such a supplementary supply for the fire brigade, even if it lasts for only one hour.

"Protective levels can be established to prevent fire-bombs from penetrating the factory or to any particularly vulnerable floor. The following materials are proof against penetration by the 1-kilo bomb: 2½ inches reinforced concrete, 3/16-inch steel plate, ⅛-inch steel plate plus 1 inch breeze concrete, 2 inches paving stones, or a single thickness of well-tamped standard sandbags. To render floors and constructional work fire-resisting it is necessary to use 2 inches sand, 2½ inches brick rubble broken to pass ⅜-inch mesh, or a weak concrete mixture 2½ inches thick. All structural timber should be treated with flame-resisting materials.

Pressure Governs Drench System

"Efficiency of drench system for windows, roofs and openings depends on the main pressure, which may be reduced seriously in the event of a big fire. A "natural" fire break is a road or open space 80 feet wide or more. Fire brigades with deluge sets with jets up to 2½ inches, carrying 200 feet or more, require a water supply of 1200 gallons per minute for each 2½-inch nozzle. To provide artificial breaks in streets for less than 80 feet wide, it is necessary to brick up every window facing the break. If it is impossible to do this, wired glass windows and fire-resisting shutters (and a patrol at dusk to see that shutters are closed and remove all inflammable material near the window) and perhaps an increase in the height of the parapet, may suffice."

Those are the general arrangements for fire protection which are essential for every factory, especially in order to facilitate the work of fire brigades. But there are several other precautions which are taken in regard to individual action by fire-watchers. Thus, most factories are equipped with large stocks of sandbags and buckets of sand, long-handled shovels, and stirrup-pumps with long hoses. These are placed at strategic intervals throughout factories (generally on top floors) so that when a fire-watcher

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Photo by U. S. Army Signal Corps

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comes across a fire-bomb or a newly started fire he has material at hand to deal with it at once. If caught in their early stages not only fire bombs but actual fires can be extinguished by the application of sand or by the sprinkling of water from a bucket via the stirrup-pump. A sprinkler fitting is used because if a jet of water is played on a fire bomb, an explosion results, whereas a spray merely causes the bomb to burn out faster.

In addition to the simple fire-fighting materials of sand and water, there have been many other patented articles introduced. These include a number of specially prepared liquids, treated chemically, which the makers claim can extinguish bombs and fires six or seven times more quickly than water. Asbestos fire shields, patented bomb-scoop rakes (enabling a fire bomb to be picked up at a safe distance and placed in a tank of water), automatic water pumps, asbestos fire-fighting suits and helmets and patented one-man fire-fighting apparatus worn like battle dress are among other products offered for fire fighting. Of a more heavy nature, there are such things as specially constructed water trailers, kept in different parts of the factory ready to be rushed to fires when the main water supply gives out; patented steel machines for storing tremendously long pipes and hoses in the smallest possible space; precast concrete individual shelters for roof fire watchers that are blast, debris and splinter-proof.

Must Fire-proof Timbers

There is one other important aspect of fire fighting—adequate pre-raid protection of structural timber. In the majority of factory fires it has been found that most of the fuel has been supplied by the timber contents of the buildings. Even though the timber may represent a small proportion of the total structure, it may be responsible for the damage of the whole. The recognized methods of fire-proofing new timber consist of impregnating the timber with an aqueous solution of various salts. Usually this is effected by placing the timber in large cylinders to which a vacuum is applied. The cylinder is then filled with solution and pressure applied up to a maximum of 200 pounds per square inch for a period of about 4 hours. The timber is then removed, having absorbed from 10 to 20 pounds of solution per cubic foot.

This method involves the use of a permanent and extensive plant and is economic when the demand for treated timber is fairly large and regular. This, together with the fact that the technique of treatment is not simple, has resulted in the creation of several installations in this country specializing in this work

where timber can be treated or from which treated timber can be obtained.

There is an alternative method, however, known as the hot and cold open tank process. The timber is immersed in the solution in a tank which is heated to about 200 degrees Fahr. After maintaining the temperature for several hours, the solution is allowed to cool and then the timber is removed. This method is good for treating boxes and packing cases.

As regards the chemicals used for fire-proofing solutions, the one most popular is monammonium phosphate dissolved in water to the extent of 10 to 20 per cent. Other chemicals are ammanium sulphate, ammonium chloride, borax and boric acid. It should be remembered that the impregnated timber should be re-dried. As regards treating timber in situ, liberal brush or spray applications of concentrated aqueous solutions or of patent fire-retardant paints (water paints with a base of sodium silicate or water paints consisting essentially of calcium sulphate plaster) are suitable.

Watch Position of Timbers

Finally, when planning the protection of timber parts of factory buildings, it should be realized that the actual disposition of the timber has an influence on the fire-resistance of the building as a whole. For instance, a long timber-closed sloping or vertical duct such as occurs when vertical timber members or sloping rafters are boarded on both sides, is conducive to the rapid spread of fire for these ducts act as chimneys along which the flames spread quickly. In addition to the application of a fire-retardant paint, periodic cross barriers are desirable to subdivide the ducts into box-shaped compartments. Continuous narrow spaces between woodwork should be avoided.

These methods, properly applied, reduce the damage from fire to a minimum. But there are other dangers of damage from air raids such as actual structural damage from explosive bombs, the breakage of windows and other glass, and the damage caused to materials by gas. For the first danger, concrete is invaluable. Most British factories have erected concrete walls outside all important rooms or shops. Sometimes the walls extend right around the place, sometimes they guard only entrances and other unguarded openings where bomb blast might penetrate. Where concrete is not obtainable, good protection will be given by extra thick walls of tough bricks, perhaps with an added coat of sandbags. The common or garden sandbag is always useful, and many factories have used them extensively to board up small-

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★ Thanks to an ingenious application of several Curtis Air Cylinders, the automatic copper and nickel plating equipment of the Gerity-Adrian Manufacturing Corporation can now handle 270 racks of work per hour through five separate units.

Curtis Air Cylinders provide automatic transfer of work racks between the cleaning, plating, and rinsing units of the installation, which was installed by Crown Rheostat and Supply Company, Chicago. Each transfer unit is controlled by two Curtis Air Cylinders, one operating the lift mechanism vertically and the other operating the horizontal or transverse motion of the frame.

The installation eliminates lengthy drive shafts, affords any desired time cycle for the various steps in the transfer, and allows rearrangement of the entire sequence of operations at will. It greatly simplifies previous arrangements and has materially speeded up the production of finishing huge volumes of die castings.

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er windows or gratings and to fill in any small weak points. They are exceptionally resistant to blast.

The only essential point to remember is to have the sandbags treated for rot resistance. At the beginning of the raids many firms hurriedly laid down sandbags and after the first shower of rain they rotted open and all the sand was scattered. Now there are several treatments available.

The problem of window protection in factories is more important than might at first seem to be the case. Every factory possesses enormous areas of glass coverings (windows, partitions, etc.). Obviously the ideal system would be to unmount all glass, fill up windows with sandbags, and so on. This would do away with the prevalent dangers of broken glass falling from windows and being driven into workshops, hitting workers and machinery. However, it is usually essential to have some method of letting in daylight. Therefore the British have tackled the problem by a process of substitution. This is recommended by the Ministry of Home Security as the safest course and consists of taking out the glass from windows, etc., and substituting nonsplintering materials, preferably of a translucent type.

Textile substitutes have been used for side windows and internal partitions, but stronger materials are needed for the replacement of roof glasses. For roof glass which can be permanently obscured, most factories use fabric bitumen treatment, consisting of sticking a textile fabric to the outside of the glass with bituminous adhesive. After it has dried, a second bituminious coat is applied. This treatment should extend over the glazing bars, but the fabric should everywhere be attached or in closed contact with glass.

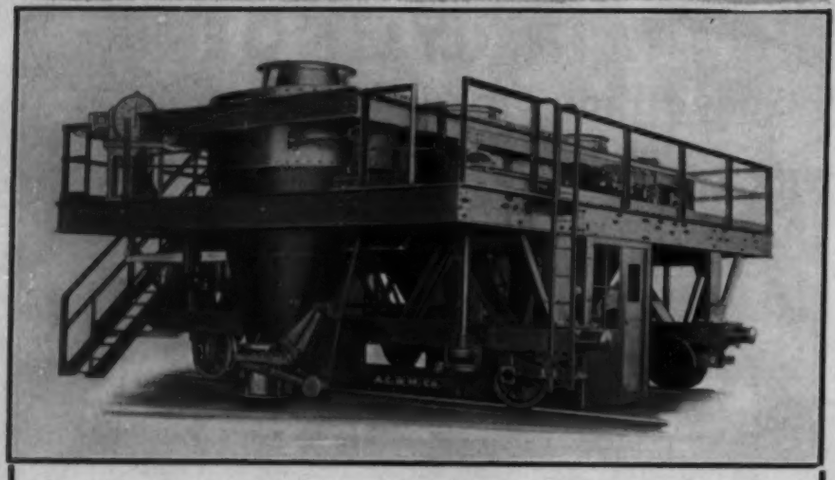
For roof glass which must be kept clear, the most popular method is to insert wire netting of not more than 1-inch mesh or ¾-inch mesh of expanded metal, fitting it closely under the plain glass. Under wired glass, 2-inch mesh wire netting affords sufficient protection. Vertical plain glass is either treated with fabric bitumen or pasted over with stout paper (in which case the whole of the glass surface must be covered). For internal glass in partitions, screens, etc., the simplest solution is to remove the glass altogether. Finally, with regard to large plate glass windows in showrooms or shops, the best course is to reduce the area to the minimum (boarding up the rest) and either use a toughened glass or some form of translucent pasted strip.

Gas Falls Slowly

The question of gas-proofing applies mostly to perishable goods. But every large factory possesses large quantities of foodstuffs for canteens and so on. British authorities long ago issued instructions pointing out that gas sprayed from aircraft may take 20 minutes or half an hour to fall and would be very difficult to see. Therefore factories desiring to protect goods or parts of their buildings are advised to brick up the room or warehouse or to introduce a panel edged with felt to give a gas-tight fit.

Doors are fitted with a draught excluder and door stops are covered with felt on the floor outside (while a blanket can be put on each side of the door as an air-lock). Fireplaces are stuffed with rags and sealed with brown paper or with ventilators, air bricks, waste pipes, keyholes and any other cracks or crevices. It has been found practical to cover foodstuffs with tarpaulin sheets of the oil-dressed type. If these are not available, a temporary protection can be made with canvas, sacking, corrugated iron, etc., although these should not be in direct contact with foodstuffs. In warehouses, foods in sacks or other permeable containers should, wherever pos-

COKE OVEN EQUIPMENT



COAL CHARGING CARS

Atlas coal charging cars are preferred equipment on most ovens because they are designed to suit operating conditions exactly, and include those design features which insure dependable operation with low maintenance.

* * * * *

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sible, be stored on middle floors away from windows. Water, too, should be made gas-proof. A simple way is sterilization through the addition of chlorine (either gaseous chlorine or compounds having "available" chlorine, such as hypochlorites of sodium or calcium).

It should be emphasized that A.R.P. for factories (as for anything else) should be approached from a constructive rather than a negative angle. Efficient preparation, as I have shown, can render harmless the majority of potential air raid damage. Fires that are extinguished the moment they break out never have the chance to spread and cause serious damage. Windows that have been treated cannot spread flying glass splinters causing injuries to workers. Walls that have been strengthened (even, often, roofs) may easily withstand many types of bombs. In any case, the extra protection will lessen the effect of the bomb explosion. Materials that have been adequately protected will resist the poisons of gases. Above all, men and women who have been trained in the necessity for co-operation, in the importance of sticking to well-defined A.R.P. rules, recognizes the needlessness of any form of panic.

Know-How Breeds Confidence

Britain has developed a two-front attack in the A.R.P. campaign. There is a nation-wide group of professional firemen and other civil defense men such as ambulance men, demolition men, stretcher-bearers, first-aid men, wardens, etc. They are the *mopping-up troops*, efficient, minutely equipped and with limitless resources. But there is also a nation-wide group of fire-watchers, first-aid men and other helpers who are stationed in every factory, in every warehouse, in all large premises. They are the on-the-spot *shock troops*—amateur, less well equipped but very highly organized.

Our capacity for dealing with air raids is now such that, with the shock troops meeting the danger at the earliest possible moment (aided by first-class preliminary precautions) there is more frequently than not a dearth of work left for the mopping-up troops when they arrive. In the case where the job is an unusually big one, there is invariably an excellent and instinctive co-operation between the two groups.

Before we had raids we were uncertain, afraid, incapable. Having experienced them we have now found confidence because we *know* how to deal with them. It is hoped that this article will help American works managers and personnel to approach their A.R.P. problems with some of that same sort of confidence.

In the Midst of the ATTACK!
KEYSTONE Wire
BULLET CORES
In the headlines you read the success of a daring Commando raid. Note how the reporting emphasizes one overpowering factor—*complete equipment*... quickly charging planes, escort vessels, barges, tanks and guns.
No mention, of course, is made of the thousands of "fighting" items made of WIRE. And yet their presence is indispensable — in forms such as the few illustrated here.
Yes, tremendous tonnages of the right types of wire are daily bolstering the all out ATTACK. That's why Keystone's entire facilities—from the open hearth furnaces to shipping platforms — are "drafted for the duration", twenty-four hours a day.
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STEEL & WIRE CO.
PEORIA • ILLINOIS
Special Analysis Wire for All Industrial Uses
SAMSON SPRING WIRE

Develops Finer Grained Industrial Film

Radiographs of lighter metals with excellent detail and contrast, with much shorter exposures now can be produced by a new and faster fine-grain industrial film recently developed by Photo Products Department, E. I. du Pont de Nemours & Co., Wilmington, Del.

Known as type 506, the emulsion is specifically for use without fluorescent intensifying screens. It can be used with or without conventional lead screens.

Evaluations in the Du Pont laboratories indicate the film may have nearly twice the speed of the fine-grain films industrial radiographers have been accustomed to using. The new film also is said to possess good latitude and graduation along with the added speed feature.

ASA Approves 23 Standards Developed by ASTM

Approval as American standards of 23 standards and specifications developed by the American Society for Testing Materials is announced by American Standards Association, 29 West Thirty-ninth street, New York.

Seven deal with wrought-iron and wrought-steel pipe and tubing; 12 cover specifications for testing materials for boilers, pressure vessels, flanges and boltings, locomotives, etc.; two cover malleable iron castings and cupola malleable iron and two deal with fabricated steel bars and welded steel wire fabric for concrete reinforcing.

These specifications cover such subjects as process of manufacture, chemical composition, check analysis, heat treatment, finish, marking, inspection test specimens, welds, size and spacing dimensions, etc.

All of the standards are available from the association headquarters at 25 cents per copy.

1. Deposition rates for the larger downhand rods are frequently more than double those of the smaller, all-position types.

2. A minimum of stub end losses because of maximum use of the electrode can effect savings of as much as 7%.

3. Overhead crane service and the attendant hazards to safety are reduced to a minimum when positioning is used.

POSITIONED WELDING

with DOWNHAND ELECTRODES SPEEDS PRODUCTION

TIME SAVINGS on welding operations have been estimated as high as 50% when downhand positioning is used. Many factors contribute to this, including faster welding because of the more rapid deposition rate of downhand electrodes and the easier handling and maneuverability of the work.

Other shop operations are accelerated also, as the use of cranes and additional men in handling the weldment are required only for the initial set-up.

Then too, a positioned weld is a *better* weld as downhand electrodes provide metal having superior physical properties and assure neater, cleaner deposits.

Specialists in welding for nearly 40 years. Manufacturers of Murex Electrodes for arc welding and of Thermit for repair and fabrication of heavy parts.

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MUREX
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Issues Recommendations on Dental Equipment

Copies of simplified practice recommendation R195-42, "Dental Excavating Burs," are now available according to the Division of Simplified Practice, National Bureau of Standards, Washington. It embodies practices developed for and in co-operation with the Health Supplies Branch, War Production Board, as part of simplification program of dental equipment and supplies.

The recommendation will reduce the number of bur sizes from 75 to 18, representing an elimination of 86 per cent.

Copies of the recommendations may be obtained from the superintendent of documents, Government Printing Office, Washington, for 5 cents each.

New Welder's Cover Glass Stays Clear 100 Hours

By use of an entirely new technique, a welder's cover glass, Klearsite, recently developed by Carter-Lockard Co., Los Angeles, will stay clear for over 100 hours, welding time, repelling sparks and molten metal with which it comes in contact. "Dill berries", which stick to ordinary glass, it is said, slide off this new glass.

Announces Improved Flux For Welding Aluminum

An improved, free-flowing flux, Flo-Ez-Flux, for gas welding aluminum and aluminum alloys is announced by Park Stewart, 1054 Carbis street, Worthington, Pa. The product positively will not solidify or deteriorate, according to the manufacturer.

New Combat Helmets

(*Continued from Page 123*)

painting treatment and remains as a permanent record of the steel going into each helmet.

To obtain the correct shape in the helmet and at the same time effect sufficient cold working of the steel to meet ballistic requirements, all in a single operation, is no simple task. Weeks of experiment and research were required, with particular attention focused on design of dies and selection of the proper die steel. Depth of draw is 7 inches, and the helmet shape has pronounced curvature of the rim both from front to back and from one side to the other, making the operation in reality a combination of drawing and upsetting.

Use Two Types of Presses

Two types of presses are currently in use, one with three die sets, producing three pieces per stroke; the other, with a single die. In the pressing operation, a hold-down ring first clamps the rim of the circular blank, and a punch attached to the ram descends to form the shape of the dome. The lower die is a ring into which the punch descends, all the working of the metal being done by the punch and the hold-down.

To attempt to apply conventional methods for deep-drawing cold-rolled sheet steel, such as are common in automotive practice, would have resulted only in failure in the helmet forming work. Hence new techniques had to be worked out, new types of tools and dies perfected. Both water hardening and oil hardening types of alloy and high-speed tool steels were tried, but it was finally ascertained that best results could be obtained from a high-carbon high-chromium air-hardening steel. Careful attention must be given to machining and polishing of dies, as well as to the matter of clearances in operation. Both single and double-operating sleeve dies were tried, the former finally being the choice.

When the work first started, rejects were excessive, at times even prohibitive. Many pieces were found to be splitting during the forming operation. Hence concentrated attention had to be given to the matter of tools and dies. At the same time, much study was devoted to the material itself. Metallurgists probed the effect of minute imperfections and surface defects on the performance of the steel. They were assisted by metallurgical experts from a steel company supplying the material, and numerous changes in the normal processing and inspection of the steel at the mill were made.

So successful was the combination of proper tools and dies and the improvement in quality of the steel that rejects were lowered progressively until they now are only a few per cent.

Before McCord undertook the manufacture of the M1 helmet, a large quantity of the old M1917 design was produced, many of which are now in service. This helmet, also made of Hadfield's manganese steel, involved a draw of only about 4 inches and presented a less difficult fabricating problem. It is possible that research may suggest another type of steel satisfactory for use in combat helmets, although it is likely that a heat-treating operation would be involved in processing. The beauty of the Hadfield steel is that no heat treating is required, the cold work supplying all the necessary strength.

Following the single draw, the helmets are trimmed around the rim in small crank presses and the visor is given a further cold-working treatment known as a "spanking" operation, which both bends the visor down a small degree and works the metal in this part of the helmet. Pieces then are hung on hooks carried on an overhead chain conveyor and passed through a spray washer where they are cleaned with a kerosene-emulsion solution.

Next operation is to apply a stainless

AMPCO CASE HISTORIES

Bombers and fighters — transport ships and other aircraft — must land safely—without fail. Crushing weight and violent impact make retractable landing gear one of the most highly stressed parts of the plane. The impact of tons are often imposed on wheels, axles, struts and pinions. Each part receives brutal punishment.

Many outstanding aircraft are today equipped with landing gear having parts of Ampco Metal. Designing engineers, critical of all material entering into the construction of planes use Ampco Metal because it has proved itself under shock conditions. It's a bronze that can "take it".

Ask for bulletins describing Ampco Metal and see how it can serve you.

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THE METAL WITHOUT AN EQUAL

steel edging to the rim. Coils of 16-8 chrome-nickel steel ribbon, 0.018-inch thick and about ⅛-inch wide, are fed into rolls which crimp it into a channel-shaped bead and roll the formed head into oval loops. These loops are then cut to the size of the helmet rim, and in special fixtures are held on the rim firmly while the ends are electric welded together. Five spot welds evenly spaced about the periphery of the rim provide further tight adherence of the stainless bead.

After the bead is welded in place, a steel clip is spot welded to the inside of the helmet on either side to receive the chin strap. Pieces are hung on another monorail conveyor and passed through a phosphoric acid-alcohol solution, followed by a water rinse, water spray and oven drying.

Numerous inspections are made along this line of processing by both government and company inspectors, and after drying the helmets are ready for paint. A dull olive drab paint is applied by spraying both inside and out, the outside coating differing from that used on the inside by having mixed with it a specified amount of ground cork. The mixture of cork and paint serves several purposes. In the first place it minimizes light reflections better than the paint alone, serving to camouflage the wearer. Further it deadens any tendency of the helmet to resonate when struck, better resists attacks of heat and rain.

A completely automatic painting setup has been perfected for finishing the helmets. They are mounted on vertical spindles, about 15 inches long, which are attached at their base to a chain conveyor traveling at table height. The spindles are about 15 inches apart and carry the helmets past first the paint nozzle which sprays the interior, automatically tripping the release valve as they come opposite the nozzle. Excess paint passes into a water-wash spray booth behind the line of helmets and is reclaimed.

The line passes on to a second booth where nozzles mounted above the pieces spray the outside with the cork and paint mixture. It should be mentioned that the nozzles are fixed rigidly on supports and the spindles are caused to rotate as they pass along the line, thereby whirling the hats as they pass the paint nozzle so that the paint is distributed uniformly.

From the second paint spray booth the line of helmets, still on the spindle conveyor, loops twice through a tunnel in which are mounted 73 infra-red lamps; in other words each helmet traverses the length of the booth four times, emerging from the same end it enters. Circuit requires about 3 minutes and temperature ranges from 275 to 300 degrees Fahr.

The helmets are transferred to sewing machines where the fabric chin straps are stitched in place, following which comes a final detailed inspection, together with any necessary touching up of paint scratched in handling. Maximum allowable weight, without liner is 39.375 ounces.

One out of every 500 finished helmets is taken to a firing range in the plant where tests for ballistic properties are carried out.

Develops Fluid For Marking Metal Parts

Dies, tools or other finished parts can be marked with identifying marks with the use of a rubber stamp and an especially prepared fluid recently developed by Rives Metal Marker Co., Rockford, Ill.

After the fluid is allowed to air dry, according to the company, the part marked can be given an oil or rustproofing and is ready for shipment. The mark made is quite permanent, but may be removed if necessary without disfiguring the surface of the part.

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Maintenance—A "Must"

(*Continued from Page* 125)

Inspection record will also serve as a guide to tell when motors should be replaced because of the high cost to keep them in operating condition. Misapplications, poor drive engineering, and the like will also be disclosed.

Lubrication: One of the major features of a maintenance program, from the standpoint of effect upon the general performance of a motor, is proper lubrication.

The point has now been reached where the bearings of modern motors, whether sleeve, ball or roller, require only very infrequent attention. However, oiling and greasing of new motors is quite often entrusted to careless attendants who have been used to lubricating older designs, with housings less tight than on modern machines.

As a result, oil or grease is copiously and frequently applied to the outside as well as the inside of bearing housings. Some of the excess lubricant is carried into the machine and lodges on the windings, where it catches dirt and thereby hastens ultimate failure.

If the proper amount of a suitable lubricant is applied before starting, there should be no need to refill the housings for several months, even in dusty places.

Greasing Ball-bearing Motors: Only a high grade of grease, having the following general characteristics, should be used for ball-bearing lubrication: Consistency a little stiffer than that of vaseline, maintained over the operating-temperature range; melting point preferably over 150 degrees Cent.; freedom from separation of oil and soap under operating and storage conditions; freedom from abrasive matter, acid, and alkali.

In greasing a motor, care must be taken not to add too large a quantity of grease or it will cause too high an operating temperature with resulting expansion and leaking of the grease, especially with large bearings operated at slow speeds.

The following procedure is recommended for greasing ball-bearing motors equipped with a pressure-relief greasing system:

Make sure that no dirt gets into the bearing with the grease by wiping clean the pressure-gun fitting, bearing housing, and relief plug. Always remove the relief plug from the bottom of the bearing before using the grease gun. This prevents putting excessive pressure inside the bearing housing. Excessive pressure might rupture the bearing seals.

With a clean screw driver or similar tool, free the relief hole of any hardened grease, so that any excess grease will run freely from the bearing. With the motor running, add grease with a hand-operated pressure gun, until it begins to flow from the relief hold. This tends to purge the housing of old grease. If it might prove dangerous to lubricate the motor while it is running, follow the procedure with the motor at a standstill.

Allow the motor to run long enough after adding grease to permit the rotating parts of the bearing to expel all excess grease from the housing. This very important step prevents overgreasing the bearing. Finally, stop the motor and replace the relief plug tightly with a wrench.

Equipped with a Pressure-relief System: A motor that is not equipped with the pressure-gun fitting and relief plug on the bearing housing cannot be greased by the procedures previously described.

Under average operating conditions, the grease with which the bearing housings of these motors were packed before leaving the factory is sufficient to last approximately one year. When the first year of service has elapsed, and once a year thereafter (or oftener if conditions warrant) the old grease should be removed and the bearings supplied

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1927 saw the first application of Elastic Stop Nuts on airplanes. When it was proved that these self-locking fastenings hold tight under any combination of vibration, shock, stress, and weather exposure, they were adopted for vital connections on all American military and transport aircraft.

Meanwhile other industries, profiting by such a convincing demonstration in the air, solved many of their most troublesome fastening difficulties with the same reliable nuts.

Today there are more Elastic Stop Nuts on this country's airplanes, tanks, guns, Naval vessels, and vital war production equipment, than all other lock nuts combined.

ELASTIC STOP NUTS may be the solution to your fastening problems. Sample nuts, for field or laboratory testing, will be furnished without cost or obligation. *Write for Catalog.*

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wi.h new grease.

To do this, disassemble the bearing housings and clean the inside of the housings and housing plates—or caps—and the bearings, with carbon tetrachloride. When thoroughly cleansed of old grease, reassemble all parts except the outer caps, or plates.

Apply new grease, either by hand or from a tube, over and between the balls. The amount of grease to be used varies with the type and frame size of the particular motor. The instruction sheet which accompanied the motor should be consulted for this information.

Addition of the correct amount of grease fills the bearing housings one-third to one-half full. More than the amount specified must not be used. When reassembling the motor, any V-grooves that are found in the housing lip should be refilled with grease—preferably a fibrous, high-temperature-sealing grease—which will act as an additional protective seal against the entrance of dirt or foreign particles.

The technique for greasing motors equipped with roller bearings is very similar to that used for ball bearings.

Specific instructions for the individual design should be followed, however, because more frequent greasing or slight changes in technique may sometimes be necessary.

Oiling Sleeve Bearings: The oil level in sleeve-bearings housings should be checked periodically with the motor stopped. If the motor is equipped with an oil-filler gage, the gage should be approximately three-quarters full at all times.

If the oil is dirty, drain it off by removing the drain plug, which is usually located in the bottom or side of the bearing housing. Then flush the bearing with clean oil until the outcoming oil is clean.

In fractional-horsepower motors, there may be no means of checking oil level, as all the oil may be held in the waste packing. In such cases, a good general rule for normal motor service is to add thirty to seventy drops of oil at the end of the first year and to re-oil at the end of each subsequent one-thousand hours of motor operation.

Most fractional-horsepower motors built today require lubrication about once a year. Small fan and agitator motors will often require more frequent lubrication, with three-month intervals between oilings.

Sleeve bearing housings are provided with liberal settling chambers into which dust, dirt, and oil sludge collect. The only cleaning necessary is to remove the drain plug and drain the oil, which will flush out most of the settled material with it.

Whenever the motor is disassembled for general cleaning, the bearing housing should be washed out with a solvent. Before being assembled, the bearing lining should be dried and the shaft covered with a film of oil.

Cleaning Ball Bearing: The pressure-relief method of greasing motors, described above, tends to purge the bearing housing of used grease. Complete cleaning of bearings, therefore, is required at infrequent intervals only. For a thorough and convenient flushing when the bearings are not disassembled, the following method is recommended:

Wipe clean the housing, pressure-gun, and relief fittings, and then remove both fittings. Every care should be taken to keep dirt out of the bearings. A bit of abrasive once in a bearing may not be removed even with the most thorough cleaning. Afterwards, it may become dislodged and get between the bearing surfaces with serious results.

With a clean screw driver or a similar tool, free the pressure-fitting hole in the top of the bearing housing of hardened grease. Also, free the relief-plug hole in the bottom of the housing from old grease to permit easy expulsion of the old grease during the cleaning proc-

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WHEN industry re-orders it awards a blue ribbon — the stamp of superiority. Today almost all of Maehler's production of furnaces and ovens—the greatest in the history of the company—are being purchased by plants that already use Maehler equipment. This record means only one thing. It is conclusive evidence of customer satisfaction—conclusive evidence that Maehler furnaces and ovens have proven themselves in the field under the exacting demands of an all-out War Production Program.

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ess after the solvent is added.

Fill a syringe with grease solvent, such as carbon tetrachloride, and inject some of it into the bearing housing through the pressure-fitting hole, while the motor is running. As the grease becomes thinned by the solvent, it will drain out through the relief hole. Continue to add solvent until it drains out quite clear.

Replace the relief plug and inject solvent until it can be seen splashing in the filling hole. Allow the solvent to churn for a few minutes, and then remove the relief plug and drain off the solvent. Repeat the churning operation until the solvent runs clean.

When using carbon tetrachloride for flushing, replace the relief plug and inject a small amount of light lubricating oil. Allow it to churn for a minute or two before draining off. This will flush out the solvent. To complete the job, grease the bearing, using the method previously described.

This method permits the cleaning of all standard motors operating at an angle not exceeding 15 degrees from the horizontal (except totally enclosed, fan-cooled motors.) For these motors, the bearing at the pulley end may be flushed as described. To clean the fan-end bearing, first remove the fan cover and fan in order to make accessible the drain plug at the bottom of the housing.

Care of Insulation: Care of insulation goes hand in hand with lubrication as one of the major features of a motor maintenance program. These features concern the most vital, and probably the most vulnerable, parts of a motor.

Motors should always be stored in a dry, clean place until ready for installation. Heat should be supplied to protect against alternate freezing and thawing.

Motors that have been long in transit in a moist atmosphere, or idle for an extended period, should be thoroughly dried out before being placed in service. Since machines sometimes "sweat" as a result of a difference in their temperature and that of the surrounding air, they should be kept warm at all times to prevent this condition.

Current at a low voltage can be passed through the windings, electric heaters can be used, or even steam pipes can be utilized for protective purposes. In the case of extended idle periods, tarpaulins may be stretched over the motor and a small heater put inside to maintain the proper temperature.

Drying Out: The most effective method of drying out motors that have become wet by accident or because of "sweating" is to pass current through the windings, using a voltage low enough to be safe for the winding in its moist condition.

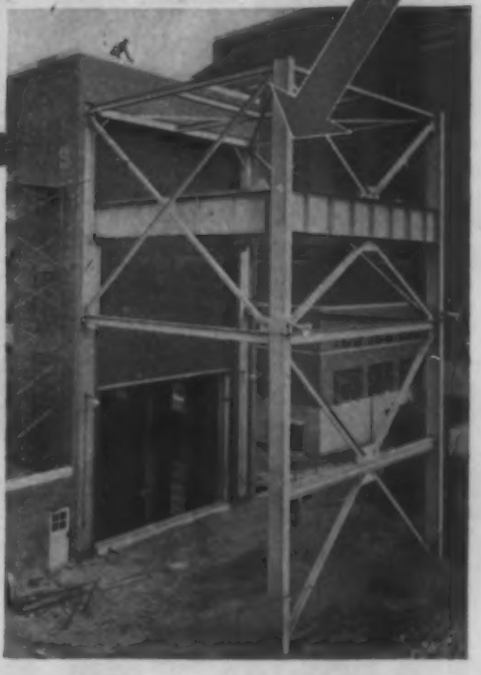
Thermometers should be placed on the windings to see that they are heated uniformly. Temperatures should not exceed 90 C (class A insulation). This method is particularly effective on high-voltage motors, where the insulation is comparatively thick.

Heat can be supplied externally by placing heating units around the machine, covering with canvas, and leaving a vent at the top to permit moisture to escape. In doing this, it is essential that there be a circulation of warm air over all the surfaces to be dried. The air should be allowed to escape as soon as it has absorbed moisture.

Twelve-inch fans set to blow air across the fronts of "glow heaters" and then into the lower part of a motor from opposite sides will produce excellent results. The temperature of the winding should not be allowed to exceed 100 C for class A insulated motors. Smaller machines can be placed in ovens, the same temperature limits being observed.

Insulation Resistance Tests: The time required for complete drying-out depends considerably on the size and voltage of the motor. Insulation resistance measurements should be taken at intervals

ROLLING UP THE SIDE OF A SEVEN STORY BUILDING IN 100 SECONDS



At the touch of an electric pushbutton, the whole rear wall of this transformer hoist house — seven stories high — rolls up into a small space beneath the roof. And it does it in only 100 seconds!

This "wall" is really a giant-sized Kinnear Rolling Door, 55 feet-six inches in height and 31 feet-four inches wide. It was built to fit a doorway big enough to permit a 120-ton overhead crane to move huge transformers through the opening.

Big as the door is, there was no problem of providing space for it to open into—not with a Kinnear Rolling Door. It coils compactly above the opening, completely out of the way. And this efficient, coiling operation is just one of the Kinnear features that make openings like this possible, and practical.

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of four or five hours until a fairly constant value is reached. These tests are a good indication of the general condition of the insulation and its ability to stand operating voltage.

The resistance should at least equal the recommended AIEE standard, which is:

Megohms equal rated voltage of the machine divided by 1000 plus kva rating of machine over 100.

Insulation resistance tests should also be made before a high-potential test to determine whether the insulation is ready for such a test and afterwards to make certain that the high-potential has not injured the insulation.

High-potential tests should be made after drying out or after repairs to check the dielectric strength of the insulation. New windings should successfully stand a high-potential test of twice normal voltage, plus 1000. Motors that have been in operation for some time should be tested with this method, after thorough cleaning and drying, using a voltage of about 150 per cent of normal voltage, applied for one minute.

Small high-potential testing sets are available for such work and are of such capacity that very little damage will result from a breakdown during the test.

Cleaning Motors: A systematic and periodic cleaning of motors is necessary to insure best operation. While some machines are installed where dust, dirt and moisture are not present, most motors are located where some sort of dirt accumulates in the windings.

Steel-mill dusts are usually highly conductive, if not abrasive, and lessen creepage distances. Other dusts are highly abrasive and actually cut the insulation in being carried through by the ventilating air. Fine cast-iron dust quickly penetrates most insulating materials.

Hence the desirability of cleaning the motors periodically. If conditions are severe, open motors might require a certain amount of cleaning each day. For less severe conditions, weekly inspection and partial cleaning are desirable.

For the weekly cleaning, the motor should be blown out with dry, compressed air (about 25 to 30 pounds per square inch pressure). Where conducting and abrasive dusts are present, even lower pressure may be necessary, and suction is to be preferred, as damage can easily be caused by blowing the dust and metal chips into the insulation. On larger D-C machines, the air ducts should be blown out so that the ventilating air can pass through as intended.

In cleaning a motor, the heavy dirt and grease should first be removed with a heavy, stiff brush, wooden or fiber scrapers, and cloths. Rifle-cleaning brushes can be used in the air ducts. Dry dust and dirt may be blown off, using dry compressed air at moderate pressure. Care must be taken to direct the air so that dust will not be pocketed in the various corners.

Grease, oil, and sticky dirt are easily removed by applying cleaning liquids like carbon tetrachloride, gasoline, or naphtha. There are several good methods of applying the cleansing liquid. Probably the best method is to spray it on. Care must be taken not to soak the insulation by dipping coils or small motors into the liquid.

Drying: While the insulation will dry quickly at ordinary room temperature after cleaning, it is highly desirable to heat it to drive off all moisture before applying varnish. If the motor can be spared from service long enough, the insulation should be dried out by heating to from 90 to 100 degrees Cent.

While the motor is warm, a high-grade insulating varnish should be applied. For severe acid alkali, or moisture conditions where oil or dusts are present, special varnishes can be supplied.

The varnish may be sprayed or brushed on. For small stators or rotors, it is best to dip the windings into the varnish,

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cleaning off the adjacent metal parts afterward by using a solvent of the varnish. After applying the varnish, the best results are obtained by baking for a length of time recommended by the varnish manufacturer, which often is from 3 to 7 hours at about 100 degrees Cent.

If the machine must be put back in service quickly, or if facilities are not available for baking, fairly good results will be obtained by applying one of the quick-drying black or clear varnishes which dry in a few hours at ordinary room temperatures.

General Overhauling: Motors should generally be given an overhauling at intervals of five years or so, normally, or, if the service is more severe, more frequently. Such a practice is beneficial in avoiding breakdowns and in extending the useful life of the equipment. Where periodic overhauling is practiced, the following notes may be helpful.

Check the motor air gap, between stator and rotor, with feelers for uniformity. Small clearance at the bottom may indicate worn bearings.

Take the motor apart and inspect it thoroughly. Measurement of the bearings and journals may indicate need for new bearing linings. Remove the waste from waste-packed bearings and rearrange or replace it, so that any glaze on the wood is removed from its point of contact with the shaft. Any gummy deposit means that the wool should be replaced. All lubricant should be cleaned out of the bearings and a fresh supply put in when the motor is reassembled.

The rotors should be cleaned with a solvent to remove any accumulated dirt, after which any rust should be removed with fine sandpaper (not emery paper). When clean and dry, the rotors should be coated with a good grade of clear varnish or lacquer to protect them from moisture. To prevent injury to the bearings, they should be completely protected with a clean rag when the motor is disassembled.

The rotors of wound-rotor motors should be given the same treatment as the stators. In addition, soldered joints and binding cords should be inspected and any weakness remedied.

The stator bore should be cleaned of dirt with a solvent, and any rust should be removed with fine sandpaper (not emery paper). Care should be taken during this operation not to damage the top sticks or end turns of the stator winding. When the stator bore has dried, any remaining dirt in the bore should be wiped out with a cloth or brushed out with a soft brush. A hand bellows or dry compressed air at low pressure may also be used.

Additional Care for D-C Motors: To insure efficient operation of direct-current motors, the following inspection and servicing should be done systematically:

Brush Inspection: The first essential for satisfactory operation of brushes is free movement of the brushes in their holders. Uniform brush pressure is necessary to assure equal current distribution. Adjustment of brush holders should be set so that the face of the holder is approximately ⅛-inch up from the commutator; any distance greater than this will cause brushes to wedge, resulting in chattering and excessive sparking.

Check the brushes to make sure that they will not wear down too far before the next inspection. Keep an extra set of brushes available so that replacement can be made when needed. Sand in new brushes, and run the motor without load as long as possible.

It is false economy to use brushes down to the absolute minimum length before replacement. Cases have been known where brushes have worn down until the metal, where the pigtail connects to the brush, was touching the commutator. This, of course, was causing severe damage to the commutator.

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contact with the commutator has the polished finish that indicates good contact, and that the polish covers all of this surface of the brush. Check the freedom of motion of each brush in the brush holder.

When replacing a brush, be sure to put it in the same brush holder and in its original position. It has been found helpful to scratch a mark on one side of the brush when removing it so that it will be replaced properly.

When installing new brushes, fit them carefully to the commutator. To do this, insert a strip of fine sandpaper, sand side up, between the commutator and the brush. Rotate the commutator back and forth, allowing the brushes to bear on the sandpaper only when the commutator is moving in the proper direction of rotation.

The brush should be lifted so it will not touch the sandpaper, on the back pull. Sand only until the curve of the brushes is the same as that of the commutator. Be sure that brush shunts (pigtails) are fastened securely so that current will not overheat the brushes and brush holders.

Check the springs that hold the brushes against the commutator. Improper spring pressure may lead to commutator wear and excessive sparking. Excessive heating may have annealed the springs, in which case they should be replaced and the cause of heating corrected. Larger motors have means for adjusting the spring pressure, which should be 2 to 2½ pounds per square inch of area of brush contact with the commutator.

Commutator: Inspect the commutator for color and condition. It should be clean, smooth, and a polished-brown color where the brushes ride on it. A bluish color indicates overheating of the commutator.

Roughness of the commutator should be removed by sandpapering or stoning. Never use emery cloth or an emery stone. For this operation, run the motor without load. If sandpaper is used, wrap it partly around a wood block.

The stone is essentially a piece of grindstone, known to the trade as a commutator stone. Press the stone or sandpaper against the commutator with moderate pressure with the motor running without load, and move it back and forth across the commutator surface.

Use care not to come in contact with live parts. If the armature is very rough it should be taken out and the commutator turned down in a lathe. When this is done, it is usually necessary to cut back the insulation between the commutator bars slightly. After turning down the commutator, the brushes should be sanded and run in as described previously. This is not necessary after light sandpapering or stoning.

Never put oil on the commutator. Proper selection of brushes gives the commutator all the lubrication required to prevent excessive wear and to build up a good smooth operating glazed surface on the copper. The addition of oil results in the development of a high resistance film which may cause undue heating and rough brush action. The oil will also have a detrimental effect on the internal parts of the commutator.

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Water-Hardening Steel Has Unusual Toughness

A water-hardening tool steel under the brand name of Jessop RT, is now being furnished by Jessop Steel Co., Washington, Pa., for applications where extreme toughness is required above all other characteristics. It is reported to have unusual toughness and strength, and gives good performance, especially for applications classified as "battering tools."

The steel has enough ductility that it will stretch more than 4 per cent before breaking. A 1½-inch piece has a fine grained case approximately 3/16 to ¼-inch deep with hardness of about C-61/63 rockwell, it is said.

High-Quality Steel

(*Continued from Page* 132)

controlled velocity as to avoid the molds bouncing upon the stool and permitting metal to seep between the mold and stool. Furthermore, the jarring should be a vertical movement to prevent splashing upon the mold wall and resulting in scabby ingot surfaces.

Jarring is most effective when the fluidity of the metal and its depth facilitates the separation of the gases and nonmetallic inclusions. By jarring from the stool while pouring, which is the only successful mode of mechanical degasification, the gases are eliminated before any metal volume is created. Nonmetallics are brought immediately to the top, from whence they are eliminated readily by cropping at the breakdown, slabbing, or blooming mills.

Cost of Jarring Is High

While this process has some merit, the cost is high. Claim is made that the density of the ingot caused by the elimination of gases and nonmetallic inclusions is greater by reason of the improved molecular construction. Further contention is that jarred ingots have a thick skin, less chemical segregation and far greater yield than normally-poured ingots because the metal is kept in a state of agitation. Claim also is made that when the regular ingot is rolled the thin skin is ruptured and hence resultant slab or bloom is seamy, snaky and pitted whereas the jarred ingots are rolled with a smooth solid surface and excellent yield. The jarred ingot weighs from 5 to 15 per cent more than a normally poured ingot. Also that 5 to 10 times the amount of slag is present on the top of the special ingots (this is only partially true) because ordinarily this is an indicator of poor open-hearth or melting practice.

Several large steel producers here and abroad have investigated the method of jarring several buggies of ingots at a time during the pouring process at about 120 times per minute, 60 rising and 60 falling, with a vertical rise and fall of ⅛-inch. The falling jar with a terminal velocity of 1.6 feet per second and the time of fall of 1/20-second is not necessary to free the so-called nonmetallic inclusions from the ingot so the time finally was extended to 1/6-second. On the basis of primary tests it was found that the most practical system was one having the jarring elements made circular with two teeth so that the platform can be raised and dropped twice for each revolution. The rise or fall is accomplished in 1/20 of the circumference so that one-sixth of the revolution is used to lift the load and five-sixths is available to build up the energy in the fly wheel for the next lift.

For the sake of elasticity of range of speed, a variable-speed motor is employed which permits from 20 to 40 revolutions per minute or 40 to 80 lifts and drops per minute.

Fig. 12 shows two split ingots of rimmed steel of the same heat. The ingot at the left was poured by the regular procedure while that at the right were jarred by the most advance technique. Both ingots would be considered of poor quality. Both are spongy toward the top and have deep-seated globular blowholes. The regular poured ingot has small holes along this line comparable to a fairly good ingot, while the jarred ingot has the blowholes deep seated but much larger and in such a continuous chain-like formation as to form almost a distinct fracture. The regular ingot on the other hand has extreme honey-comb cavities running from the row of blowholes toward the ingot wall, a condition not existent in the jarred ingot. Between the two the regular ingot could be used while the jarred ingot was a total failure, although neither ingot was suitable.

The specification for this heat was: Carbon 0.20 to 0.23, manganese 0.30

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to 0.35, phosphorus 0.015 and sulphur 0.030 per cent. The ladle analysis was: Carbon 0.21, manganese 0.34, phosphorus 0.014 and sulphur 0.027 per cent.

The variation in carbon of the regular ingot was from 0.12 to 0.33 per cent; the jarred ingot had a carbon variation from 0.11 to 0.45 per cent. This indicates that segregation is far greater in the jarred ingot.

The regularly poured ingot is far out of line for a quality steel and clearly denotes poor open-hearth practice and that the heat was not properly shaped up nor refined.

Some years ago research heats were made to demonstrate that high-quality low-cost steels could be made, using low-cost raw materials, thus saving in alloy additions, maintaining specifications and reducing or eliminating chipping and grinding costs. Ingots of alloy steel were rolled into blooms which were pickled for scale elimination and to open up seams. All defects were eliminated by chipping which required approximately 25 man hours per ton. The next process was to further reduce the blooms into a billet section which for many grades required repickling and reconditioning before rerolling into the finished section.

It was arranged, however, to make several heats of each grade by the new proposed method starting with the first two heats:

Element	Specification	Ladle Analysis First	Second
Carbon, %	0.32-0.35	0.33	0.34
Manganese, %	0.65-0.80	0.71	0.70
Phosphorus, %	0.03	0.019	0.015
Sulphur, %	0.04	0.028	0.030
Chromium, %	0.90-1.10	1.08	1.03

The heats were permitted to lie indefinitely in the furnace sometimes 20 hours or more. They were tapped cold and with considerable skull which was desired. The bath lay "flat" from the action preceding the "block" of 15 per cent silicon pig. The heats were kept hot and the bath free of foreign and nonmetallic substances. This combination immediately reduced the time of heats approximately 40 per cent or in line with the time factor existing generally in the industry today. The pickled blooms and billets required no chipping or conditioning.

Reveals More Data

A research at a plant making forging heats for seamless tubes reveals additional information. This plant produced seamless by both the "Automatic" method and the "Pilger" method employing round ingots direct from casting floor. Big-end-up hot-top ingots were converted into blooms and these were pickled, chipped and rolled into rounds which were repickled and chipped, and then pierced and rolled on the automatic sizing or expanding mills. In both units steel of approximately 0.20 per cent carbon and forging grades were used. Results with the pilger mill and the low-carbon grades on the automatic mills were satisfactory but the forging grades were a failure. The specification of this grade was carbon 0.35 to 0.45, manganese 0.70 to 1.00, phosphorus 0.025 max., sulphur 0.045 max., and silicon 0.15 to 0.25 per cent. The highest yield was 68.9 per cent from ingot to bloom. The heat preceding the first research heat was 68 per cent yield and 49 blooms were scrapped at the chipping beds on account of bad steel after the 68 per cent. Generally the chipping required to free the blooms of seams, breaks, scabs, etc., was so extensive that there was a shortage of 22 to 47 rounds per heat. After processing into rounds and repickling extensive chipping was required.

The furnaces were rated at about 120 gross tons but heats averaged 126 gross tons each. The usual charge was composed of skelp, pipe, crops, sheet, miscellaneous, road scrap, etc. Martinsburg limestone constituted about 9.30 per cent of the total charge. All heats were

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blocked off with 3000 pounds of 15 per cent silicon pig which was necessary to completely deaden the bath. All manganese was added to the bath and silicon (50 per cent) was added to the ladle to meet the specifications. The main purpose was to maintain the bath at high temperatures and in action up to the block and after the analysis was returned from the laboratory the bath was permitted to return to a light action at the border only. All heats were caught on the way down irrespective of the condition of the bath. This was done often before the lime was up and frequently when the heat was in such condition. About 15 bags of coal were used for recarburizing. Heats having the proper bath condition were given sufficient hot metal to recarburize the bath so that the heat could be properly refined. In all heats the full number of blooms was obtained.

Former Yield Lower

Previous to this research the average yield from rounds into seamless tube was less than 50 per cent as compared to the full yield of the special heats. Ladle test samples were taken on the second and thirty-fourth ingots for determination of the uniformity of analysis per heat. The analysis of both ingots was identical: Carbon 0.39, manganese 0.87, phosphorus 0.012, sulphur 0.029 and silicon 0.24 per cent.

Deep etch tests of various sections of the rounds from different locations of the heats were exceptionally sound. Typical slag analysis follows:

	No. 1*	No. 2*	No. 3*
SiO_2	14.90	15.70	16.00
FeO	12.10	11.10	12.00
Fe	. .	.	3.00
Al_2O_3	1.50	1.54	....
MnO	11.64	11.15	9.00
CaO	45.90	46.00	47.00
MgO	4.70	5.06	5.60
S	0.26	0.23	. . .
P_2O_5	1.20	1.17	3.50

*No. 1—Before spiegeleisen addition.
*No. 2—Before tapping.
*No. 3—Typical slag analysis for .35/.45 per cent carbon steel, selected by 25 American Metallurgists.

The time of the heats varied from 11 hours to 11 hours 47 minutes which was only a slight saving in the average time even allowing for hot metal recarburization. All heats were tapped hot and were free of skull.

High-tensile, low-alloy steels may be divided into two main groups such as those yielding high strength as rolled and those requiring one of several heat treatments. Each of these groups can be broken down further to conform to specific physical properties necessitated by specific construction requirements. Chemical analyses, heat treatments and physical properties of these high-tensile steels are given elsewhere[2].

Hot topping has a marked influence on the quality of steel in that it promotes a higher yield of prime material. The advisability of using hot tops should be decided only after actual plant tests. No advantage is to be gained in hot-topping rimming grades of steel. Even in plant making low-carbon killed grades there seldom is any advantage to be had in the yield or quality between ingots produced with or without hot tops.

The use of hot tops is necessary in the production of killed steel whether straight-carbon forging grades or the vast series of alloy and special SAE steels.

Fig. 10 shows a split ingot of a special steel. SAE 4345 carbon 0.40 to 0.50, manganese 0.50 to 0.80, chromium 0.60 to 0.90, nickel 1.50 to 2.00 and molybdenum 0.15 to 0.25 per cent. This ingot, as shown, was poured with a hot top.

Fig. 9 shows a split ingot of SAE 4345 steel poured without a hot-top. This heat should have had less piping than shown in Fig. 10 because it had less deoxidizing agent as evidenced by

[2]"The Steel Physical Properties Atlas", American Society for Metals, Cleveland.

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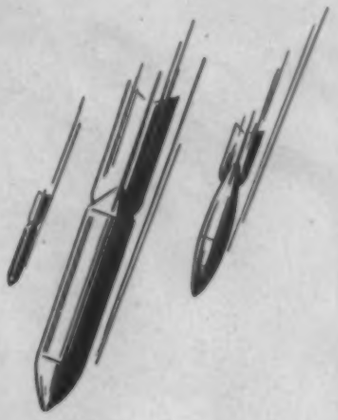

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the blowholes along the ingot surface toward the bottom part of the ingot.

Antipiping compounds consist mainly of carbonaceous matter and irreducible oxides. When placed on top of a molten ingot they slowly oxidize, and generate heat, remaining nonmetallic elements and acting as an insulation. Care must be taken in using these compounds to guard against injurious elements getting into the prime portion of the ingot.

BIBLIOGRAPHY

1. "Steel Ingots." W. H. Hatfield, Anniversary Volume of the Science Reports of the Tokoku Imperial University, 1936, vol. 120, p. 577.
2. "Structure of Rimmed Steel Ingots." T. S. Washburn and J. H. Nead, American Institute of Mining and Metallurgical Engineers, *Metals Technology*, 1937, Jan., vol. 4, No. 1.
3. "Some Factors Influencing Segregation and Solidification in Steel Ingots." L. H. Nelson, American Institute of Mining and Metallurgical Engineers, 1937, *Metals Technology*, 1937, April, No. 3.
4. "Dendritic and Non-Dendritic Primary Structure in Ordinary Mild Steels." J. Seigle, *Chimie et Industrie*, 1937, vol. 37, April, p. 629.
5. "The Effect of Copper on Some Alloy Steels." R. Harrison, British Iron and Steel Institute, 1938, vol. 137, No. 1, p. 285P.
6. "Quality of Seamless Tubes Made from High-Arsenic Steel." D. Ludogovsky, *Stal*, 1936, No. 8, p. 64 and No. 10, p. 57.
7. "Rate of Solidification of Rimming Ingots." J. Chipman and C. R. FonDersmith, American Institute of Mining and Metallurgical Engineers, *Metal Technology*, vol. 4, No. 7.
8. "Crystallization and Structure of the Ingot." V. O. Hagen-Torn, *Metallurgist*, Russia, 1937, vol. 12, No. 2, Feb., p. 3.
9. "Distribution of the Metalloids in Rimmed Steel Ingots." J. W. Halley and T. S. Washburn, American Institute of Mining and Metallurgical Engineers, *Metal Technology*, 1938, vol. 5, Feb., No. 2.
10. "A Note on the Slow Cooling of Ingots." W. J. Rees, British Iron and Steel Institute, 1939, vol. 139. No. 1, p. 315P.
11. "Freezing of Rimmed Steel." H. D. Hibbard, *Iron Age*, 1938, vol. 142, Oct. 13, p. 69.
12. "Mechanism of Solidification and Segregation in Low-Carbon Rimming Steel Ingot." A. Hayes and J. Chipman, American Institute of Mining and Metallurgical Engineers, *Metals Technology*, 1938, vol. 5, Dec.
13. "The Structure of a Steel Ingot." H. Thyssen, Revue Universelles des Mines, 1939, vol. 15, June, p. 232.
14. "On the Macroscopic Structure and Solidification of Steel Ingots." L. Bruno, Revue de Metallurgie, Memoires, 1939, vol. 36, July, p. 335.
15. "Solidification of Steel in the Ingot Mold." Alexander L. Field, American Society for Metals, 1927, vol. 11, No. 2, Feb., p. 264.
16. "Progress in the Study of Normal and Abnormal Steel." S. Epstein and H. S. Rawdon, American Society for Metals, 1927, vol. 12, No. 3, p. 337.
17. "On the Properties of Steels." James E. Howard, American Society for Metals, 1927, vol. 12, No. 4, Oct. p. 622.
18. "Segregation of Dissolved Elements and Its Influence Upon Distribution in Steel." E. G. Mahin and H. J. Dillon, American Society for Metals, 1927, vol. 12, No. 6, Dec., p. 905.
19. "Armco Ingot Iron." Reid L. Kenyon, American Society for Metals, 1928, vol. 12, No. 2, Feb., p. 240 and No. 3, March, p. 435.
20. "Steel Ingots." Herbert H. Ashdown, American Society for Metals, 1930, vol. 18, p. 100.
21. "Inclusions in Iron—A Photomicrographic Study." C. R. Wohrman, American Society for Metals, 1928, vol. 14, No. 3, Sept., p. 385.
22. "Effects of Antimony, Arsenic, Copper and Tin in High-Speed Tool Steel." H. J. French and T. G. Digges, American Society for Metals, 1928, vol. 13, No. 6, June, p. 919.
23. "Identification of Inclusions in Steels." Leland E. Grant, American Society for Metals, 1931, vol. 19, p. 165.
24. "Nonmetallic Inclusions in Steel." Stephen F. Urban and John Chipman, American Society for Metals, 1935, vol. 23, Part 1, p. 93 and Part 2, p. 645.
25. "The Influence of Nonmetallic Inclusions Upon the Precipitation of Primary Cementite in Hypereutectoid Steels." E. G. Mahin and E. F. Lee, American Society for Metals, 1935, vol. 23, p. 382.
26. "On Naming the Aggregate Constituents in Steel." J. R. Vilella, G. E. Guellich and E. C. Bain, American Society for Metals, 1936, vol. 24, p. 225.
27. "Utility of Statistical Methods in Steel Plants." H. J. Hand, American Institute of Mining and Metallurgical Engineers, *Metals Technology*, 1938, vol. 5, Aug.
28. "The Influence of the Steel Base Composition on the Rate of Formation of Hydrogen Swells in Canned-Fruit Tinplate Containers." T. P. Hoar, T. N. Morris and W. B. Adams, British Iron and Steel Institute, 1939, vol. 140, No. 2, p. 53P.
29. "Antimony in Mild Steel." B. Jones and J. D. D. Morgan, British Iron and Steel Institute, 1939, vol. 140, No. 2, p. 115P.
30. "The Occurrence, Origin and Detection of Flaws and Defects in Steel." E. Gregory, *Engineer Inspection*, 1939, vol. 5, Jan.—Mar., p. 4.
31. "Residual Metals in Open-Hearth Steel." J. D. Sullivan and A. E. Pavlish, *Metals and Alloys*, 1939, vol. 10, June, p. 184.
32. "Production Research in Iron and Steel—Its Importance and Value," H. T. Hildage, *Iron and Steel*, 1939, vol. 13, Oct., p. 7.
33. "Heterogeneity of Steel Ingots" Journal of the British Iron and Steel Institute, 1926, No. 1, pp. 39-151, 1928, No. 1., pp. 401-547, 1929, No. 1, pp. 305-376, 1932, No. 2, 1933, No. 4, 1935, No. 9, 1937, No. 16, 1939, No. 25, 1939, No. 27.

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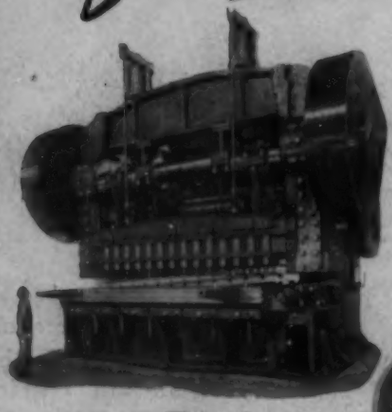

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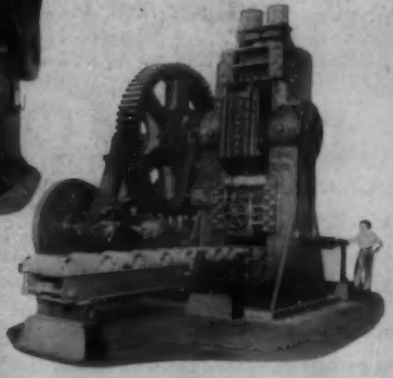

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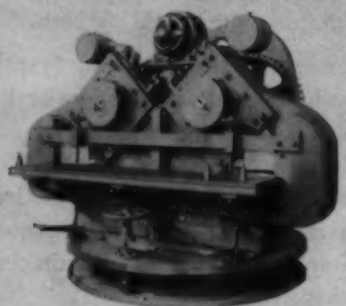

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Book on Advanced Blue Print Reading Available

A 300-page instructional book on "Advanced Blueprint Reading" is now on the list of educational literature available for war production training of workers, according to O. W. Winter, president, American Society of Tool Engineers and national chairman of the society's education and training committee.

The book, with a few other monographs, will complete the national defense training project of educational literature under supervision of the New York state education department and distributed with the co-operation of the ASTE. The state education department also announces copies of any of its defense training books and monographs may be obtained directly from the department.

12,000 Watt Hours Produce One Pound of Magnesium

In order to produce a pound of Magnesium, according to authorities, it is necessary to consume approximately 12 kilowatt hours of electric current. About 10 kilowatt hours are required to produce a pound of aluminum. About 0.325 kilowatt hours are consumed in producing a pound of electric furnace steel.

Translated into terms of illumination with an electric lamp, 12,000 watt hours are required for producing a pound of magnesium, 10,000 for a pound of aluminum and 330 watt hours for a pound of steel.

Steel Wires Replace Fabric in V-Belts

A new type of V-belt utilizing steel wires in place of conventional fabric or cord carcasses and especially adapted for motors of tanks and armored vehicles is announced by Goodyear Tire & Rubber Co., Akron, O. It is said to provide increased strength, higher resistance to heat and far less stretch than preceding types of belts, important because of the inaccessibility of fanbelts and the tremendous amounts of heat developed by powerful motors in armored vehicles.

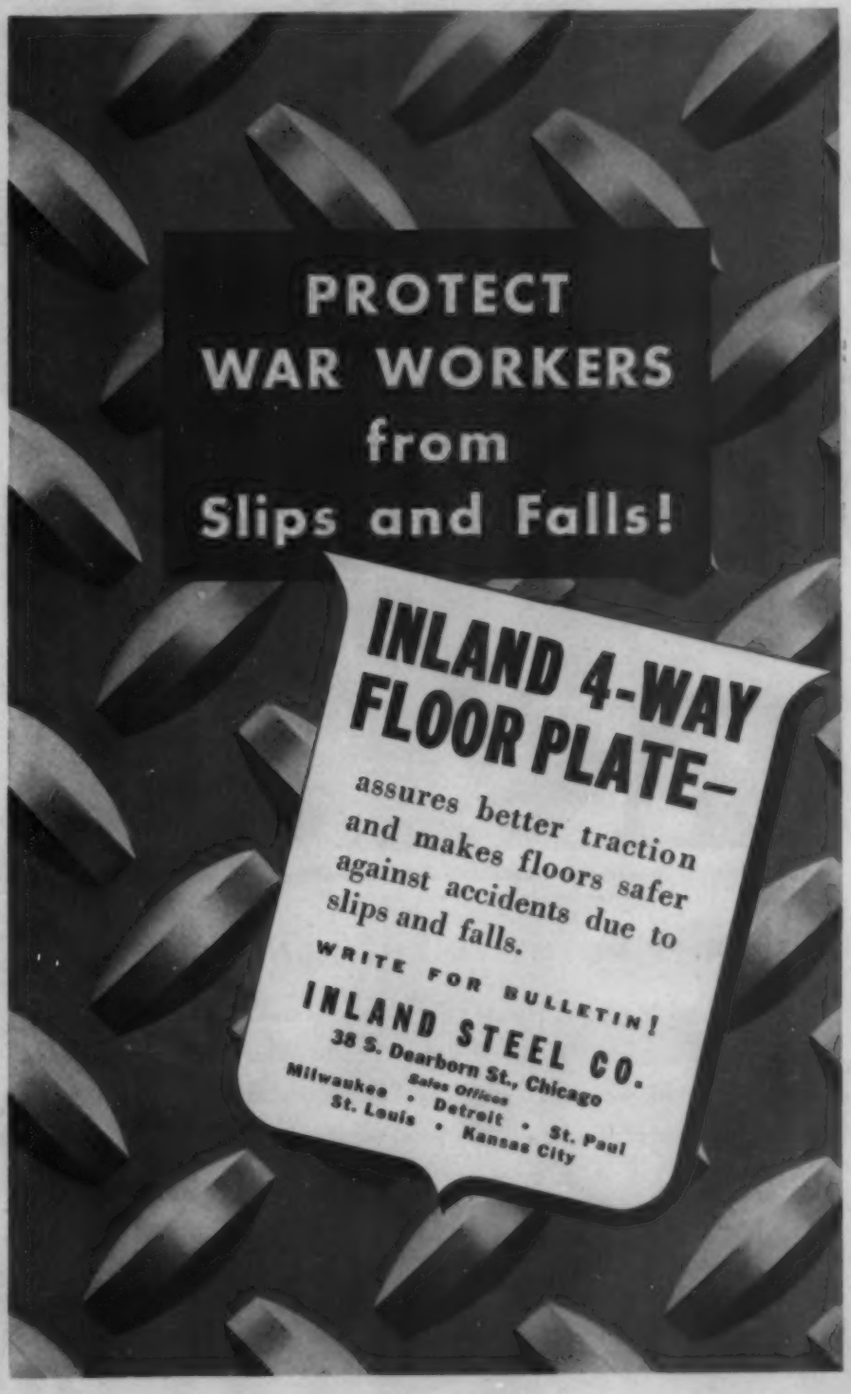
New Welding Handbook Presents Latest Data

Welding Handbook, fabrikoid, 1593 pages, 6 x 9 inches; published by American Welding Society, New York, for $6 in United States, $6.50 elsewhere.

With growing importance of welding as a war production and industrial tool in construction of ships, tanks, planes, guns, ammunition and machinery, this second edition meets general need for general latest information in concise form. The volume covers first the physics and metallurgy of welding and weldability of steels; second, welding and allied processes; third, materials used; fourth, training, inspection and safety; fifth, design considerations and testing; sixth, applications of welding.

The aim has been to assure accuracy of statements and that recommendations are authoritative. To this end the committee selected 270 leading welding experts from those available in each field, as members of the committees preparing the several chapters. Desirability of impartial treatment of subject matter has been kept in mind by these committee members and the handbook committee.

The text is generally arranged in handbook style, but a logical sequence has been followed, with enough explanatory matter so that it may be used as a textbook in engineering schools and as a reference book in trade schools. Primary purpose, however, is to give engineers an authoritative reference book on the technical phases of welding.



Crane Inspection

(*Continued from Page 135*)

running the bridge up and down the aisle a twisting of the bridge is noted. There could be several causes for this. The most common, however, is track wheel wear to different diameters. For example, when one driver wheel wears to a smaller diameter than the other, the larger wheel will travel ahead causing the bridge to twist. Incidentally, the continual twisting of the bridge tends to loosen the bolts in the gusset plates that hold the girders to the end trucks.

Continuing the inspection, the trolley operates normally. The collector slides, however, are cutting the span wires and should be lubricated to avoid excessive wear on wires. The hoist is now operated and the overtravel limit switch is tried out. The accelerating relays are rather slow in picking up, which, when hoisting a heavy load, could cause the load to overhaul the motor before the motor gets enough power to raise the load, thus dropping the load. An adjustment of the rheostat in the coil circuit mounted on the panel will correct the trouble. This adjustment may be made by the inspector.

Hoisting Cable Carefully Checked: A very careful examination is made of the hoisting cable. Often this can be done from the crane cage. On a 40 or 50-ton

Fig. 3. (Above)—Brake setting must be exact for safe operation. Inspector is checking spring tension, which must be set as specified on the name plate attached to each brake

Fig. 4. (Below)—When crane accelerating relays are slow in pick-up, rheostat in the coil circuit is adjusted with a screwdriver to give the hoist motor enough power to raise the load and thus prevent dropping

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crane, however, the cable is too far away from the cage to make a thorough inspection and is examined from the crane landing platform. Sound judgment is required in determining the safety of a worn cable in order to get the maximum of life from the cable and maintain a good safety factor. For ordinary hoisting, the cable safety factor should be 5:1, but where hot metals are handled, the ratio should be 7:1. When a cable is 40 per cent worn or has three or more wires broken in each strand, it is replaced. The hook bearing and block sheaves are inspected at this time.

Bridge Inspection: Next to be inspected is the bridge, so we will open the main switch and start with the motor. The motor is very warm, probably due to the bridge's twisting and causing the flanges of the track wheels to bind on the rails, thus throwing an overload on the motor. The commutator, brushes and armature bearings are checked for defects and wear. To check the wear of the armature bearings, a screwdriver is used as a lever between the teeth of the line shaft gear and under the motor pinion. Raising the screwdriver will show the wear in the bearing. If the bearing at the pinion end of the armature shaft is very little worn it can be assumed that the bearing at the commutator end of the motor is in good condition since the bearing at the pinion end of the motor is subject to the most strain.

Bearings on the hoist and trolley motors are checked in the same manner. Line shaft bearings are checked as we move along the bridge to the driver track wheels. Here we definitely find the source of the bridge's twisting. The head of the rails has forced the metal from the inside of the flanges of the driver track wheels down on the tread of the wheel, building a radius on the tread and making the wheel larger than its former diameter. The flanges of this wheel are worn very thin, and the most economical way to correct the trouble is to replace both driver track wheels.

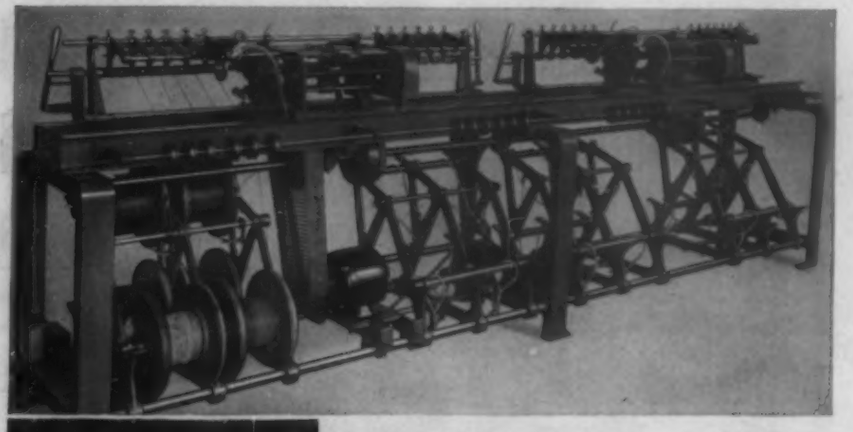
The bushing for the main current collector wheel is very badly worn and should be replaced. This completes the inspection of the bridge.

Hoist: We now come to the hoist, starting with the motor. The brushes are found short and the commutator rough and dirty. Since a dirty commutator will impair the effectiveness of the dynamic braking, we will have the commutator dressed and new brushes installed. It might be explained here that dynamic braking is the current generated by the speed of the motor after the motor circuit has been opened by centering the master switch. This generated current is shunted across the armature in the reverse direction, bringing the motor to an immediate stop. Dynamic braking is an extra precaution to prevent the blocks from running up and breaking the hoisting cable, should the electric brakes fail to close.

Now the electric brakes are checked. On a crane of this capacity, three brakes are used—two on the intermediate shaft and one on the armature shaft. These brakes must close simultaneously; therefore, their setting must be very exact.

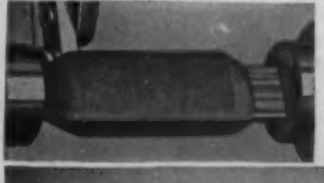
The trolley motor, bearings, gears and track wheels are checked and no defects found. A general survey for cleanliness is made as we leave the crane. Before inspecting the next crane on the day's schedule, and while we have a clear picture of the mechanical and electrical condition of the crane, all defects found are noted and entered in a report.

Report is made out in triplicate and each defect with approximate repair cost is written down. The original and one carbon copy are sent to the supervisor of maintenance of the department involved. He retains the carbon copy for his file, approves the expense on the original copy and sends it to the crane repair department of the factory service division to have repairs made. When



Above: FIDELITY Screw Traverse Machine winds wire on conventional type wooden or metallic spools.

Below: FIDELITY Spooling Machine with new hydraulic control to wind wire on flat or square sticks from brake-controlled reels.



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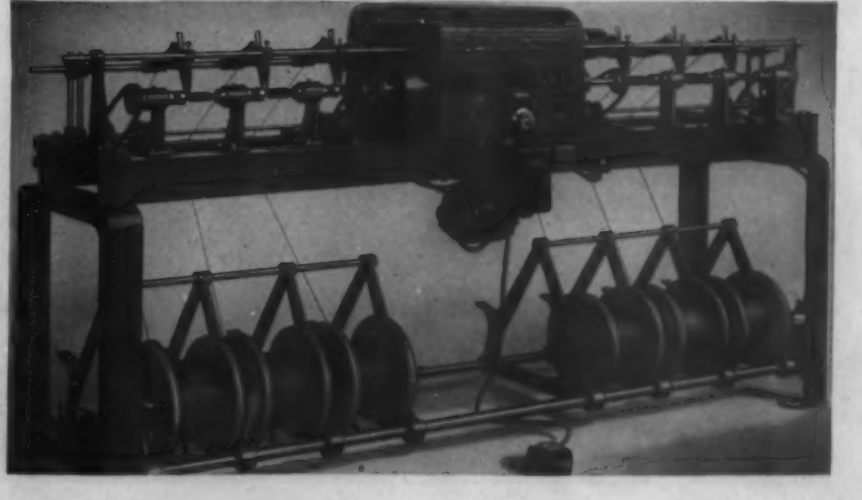

the crane repair department completes the repairs, the original copy is sent to the crane inspector, who checks and approves the repairs made. The third copy is kept on file by the inspector and is replaced later by the original copy when repairs are completed.

New Gage Saves Hours In Shell Production

A new gage or testing device which has virtually eliminated government turn-down of finished projectiles was announced by Joseph W. Frazer, president, Willys-Overland Motors, Toledo, O.

According to Mr. Frazer use of the new instrument has reduced rejections from an original figure of approximately 10 per cent to less than 1 per cent.

The gage is a 3-pronged instrument which fits into the cavity of a rough shell forging and pre-determines through mathematics the weight of the finished shell, he explained. This enables workers to nose the projectile so that the finished product will comply with rigid Army specifications.

The testing device was designed by Clarence Reynolds and Frank Speke, company inspectors, who spent approximately three months of "night work" in its development.

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Recent additions to our plant have increased our annual capacity of "GLOBE" Superior Ladle Brick to 42,000,000 brick per year . . . to meet the demand made necessary because of years of fully satisfactory service to the steel industry.

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Collective Bargaining As It Has Worked Out

How Collective Bargaining Works; cloth; 986 pages, 6 x 9 inches; published by Twentieth Century Fund, 330 West Forty-second street, New York, for $4.

Full length sketches of the actual workings of collective bargaining in sixteen United States trades and industries are presented in this survey and thirteen other fields are covered in thumbnail sketches. Each of the broader pictures covers the growth of organized dealings between employers and labor unions.

Most of the field work was done in 1939 but almost all chapters include developments in 1940 and about half of them include events in 1941. Like other surveys by the Twentieth Century Fund this is the joint product of three parties; the fund trustees, who chose the subject; a special committee appointed by the trustees, which had general supervision, and a special research staff which provided the factual findings.

On the basis of information in this volume and of such other knowledge as they may have the members of the committee will prepare a report which will contain the committee's analysis of the problems of collective bargaining and a program of action to deal with them. The second volume is expected to suggest policies useful both for the war effort and for the task of postwar reconstruction.

Develops Film To Protect Polished Parts

United States Stoneware Co., Akron, O., announces perfection of its nonadhesive Tygon formulations to provide easily removed temporary protection to highly polished surfaces against rust, corrosion, grease, finger markings, dust, sncratches, etc. These consist of the pure product liquefied to form a stable, nonadhesive film when dried.

The film, called Tygon Tempro-Tec is applied by brush, dip, spray or roller coating. It air dries within a few minutes at normal room temperatures to form an elastic film, unaffected by oil, grease, gasoline or corrosive atmospheric fumes or condensates.

The product strips free, peeling off as a complete film without injuring the surface beneath. It is reported to provide excellent protection for surfaces of machine parts, tools, bearing surfaces, etc., during handling, shipping and installation.

Develops Compound To Control Magnesium Fires

An All-Out incendiary bomb extinguisher, a compound in form of a nonpoisonous fine powder, composed entirely of refractory materials, is reported by United Laboratories Inc., 16810 Euclid avenue, Cleveland, for extinguishing incendiary bombs of magnesium and thermite. It is said to actually smother the blaze, converting the magnesium to a pliable dough, preventing it from burning the base upon which it is ignited.

Less than half the contents of a 10-pound bag is needed to extinguish a standard 4-pound bomb, it is claimed. The powder retains its entity until temperature of 2500 degrees is reached, when it fuses into a lava-like form. It does not cake or harden and keeps its strength no matter how long it is exposed to air, moisture, cold, sun heat, brine, salt air or chemical fumes.

Designs New Welder Trailer To Save Rubber

To aid in conserving rubber for war, Harnischfeger Corp., Milwaukee, announces substitution of an all-steel wheel portable mounting on its gas engine-driven welders for the rubber-tired trailer.

The new trailer is of the 2-wheel type, equipped with an axle and heavy duty springs, and is suitable for field work and highway towing. Wheels have a 24-inch diameter and 4-inch rim face. They are designed to permit quick change-over to a pressed steel wheel with pneumatic tire when available later.

Towing bar and trailer rest have not been changed. To compensate for harder riding the unit is equipped with a 9-leaf spring.

Ampco Extrusion Mill Houses Huge Press

One of the largest hydraulic extrusion presses in the country is housed in the new bronze extrusion mill recently placed in production by Ampco Metal Inc., Milwaukee. Its capacity is said to be approached only by mills in the East used in extruding aluminum. Bars, tubes and shapes of various sizes can be handled in the new addition.

Sodium Light Aids Microscopic Inspections

Sodium light is being used in several important war plants for surface inspection by microscope, due to its efficiency in the detection of pits, cracks and flaws in materials, according to General Electric Co., Schenectady, N. Y. Essentially an arc lamp, the sodium unit differs from the incandescent in that it requires a special socket and individual control for each lamp.

According to H. A. Breeding of the company's laboratory, the unusual perception of detail under sodium illumination is due to the monochromatic nature of the light. The eye, he said, in common with other lenses, actually focuses only one narrow wave or color band at a time. Other colors in the beam tend to fog the picture. Thus, minute details may be lost in examining an object under a light which contains all wave bands, in contrast to an examination of the same object under monochromatic light which contains only one wavelength.

As in the case of sodium lighting for night safety driving, nonchromatic light for microscopic inspection is most effective when spread uniformly over a large area rather than concentrated in small bright patches. In this way an undistorted view of both size and shape of flaws present is obtained. For most effective results, the level of the illumination should be comparatively high, especially when the contrast between flaw and surrounding material is low.

BOTTLESHIPS or BATTLESHIPS?

America is racing against *time!* The program is a gigantic one! What we build now are not *museum-pieces* nor *mantel ornaments* . . . but real-size *armaments.* Ships, tanks, guns, planes — all must be built by the fastest, most efficient methods known. Our job, as designers and builders of heavy metal-working equipment, is to help you attain the *production record* which the President has set. If you have a production problem involving our line of equipment, let a *Beatty engineer* help you make *two* ship plates grow where *one* grew before . . . or other equally vital heavy metal fabrication problems. No obligation on your part.

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Dominion Plan Controls Manpower; New Iron Ore Area Being Developed

TORONTO, ONT.

LABOR priority lists are being formulated to govern flow of manpower in the Dominion and now are in use at employment offices in principal industrial centers. Needs recorded in these lists will determine action in curtailment of least essential industries, through action of the industrial division of the Wartime Prices and Trade Board.

The lists, which will be subject to constant change, are based on labor needs within the locality for which they are provided and also will include labor requirements which can not be met in the area where the plants are located. Two basic lists have been provided for offices of National Selective Service in cities where industrial labor needs are most acute. One list names firms and the other occupations. Four groups are specified, very essential, essential, less essential and nonessential.

There is an automatic interlocking between the named firms and the types of workers they require. Organization of the labor priorities system is on a triangular foundation, with the Department of Munitions and Supply providing information on contracts let, National Selective Service putting the program into effect and Wartime Prices and Trade Board curtailing nonessential industries in areas where labor needs become most severe. In some cases the needs will be immediate, in others deferred for a fortnight or a month. As contracts are filled these plants will lose their priority rating and others will take their place.

In addition to information supplied by Department of Munitions and Supply, employers are required under manpower regulations to keep Selective Service informed of labor requirements. While immediate emphasis is likely to be greatest on direct war industries it is considered conceivable that conditions may place essential civilian needs high in the scale, such as shortage of foodstuffs. As needs of important war industries increase, through expanded production and staff loss from enlistment and army drafts there will be increasing pressure on industries in lower categories.

Gun Output Greatly Expanded

The effect will be that least essential industries will not only be held at the bottom of priority lists, finding it difficult to replace workers, but will experience steadily tightening restrictions imposed by the industrial division of the Wartime Prices and Trade Board, which will make more workers available to meet essential needs.

C. D. Howe, minister of munitions and supply, announces that Canada now is producing in a single month more than three times as many naval and field guns and small arms as it turned out in all 1941. During August three plants started production on a new four-inch naval gun, a large antiaircraft gun barrel and the Browning tank type gun. Dominion plants now are producing 12 types of guns, 15 types of carriages and mountings and ten types of small arms.

Rifle and machine gun bullets are being produced at twice the 1941 production rate. More small arms ammunition is coming from Canadian plants in one shift than prewar facilities could have produced in six months. Where 500 ammunition workers were employed in one plant, now 30,000 men are busy in two government arsenals and plants operated for the government by private

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interests are also making ammunition for special ordnance.

A new Canadian plant just started on large scale production of cores for armor-piercing bullets is rated as one of the largest of its kind on the continent, supplying cores which formerly were imported. Current production of a billion and a half rounds of ammunition per year is being increased constantly. Output represents value of $1,000,000 weekly.

Development and bringing into production the Steep Rock iron mines in the Atikokan section of Ontario is necessary to protect Canada against a possible shortage of iron ore to meet war needs, and the government will supply several million dollars to aid the company to get into production. The property has been under development for several years, financial considerations slowing up work in the past two or three years. Officials state that diamond drilling and underground exploration has indicated deposits of 100,000,000 tons of ore with 61 to more than 65 per cent iron. Recent plans call for dewatering of Steep Rock lake with the object of surface mining and open-cut operations.

New Ore Dock Planned

According to the minister of munitions and supply the government will provide $2,000,000 to $2,500,000 for an ore dock at Port Arthur and a six-mile spur line into the Steep Rock property. Further assistance will be given by a subsidy on the rail freight rate on the first 5,000,000 tons of ore shipped to Port Arthur. The dock and spur line will be operated by the Canadian National Railways. It is estimated a year or more will be required to start actual production.

Canadian manufacturers are limited to inventories of steel for a single month in the effort to prevent hoarding and additional deliveries may be made only when stocks on hand are required for production in that time, according to a new order by the steel controller. The order also restricts warehouse supplies to three months' inventory. This affects steel used in every type of product from ship plate to nails and prohibits use of steel for nonessential purposes.

August production of steel ingots and pig iron in August was less than in July mainly a result of a strike at the plant of Algoma Steel Corp. Ltd., Sault Ste. Marie, Ont., four blast furnaces being banked and steelmaking operations being suspended the last day of the month. The strike continued a few days into September and this will affect production for that month. Average daily pig iron production in August was 5245 tons, against 5572 tons in July and steel output was 8028 tons compared with 8276 tons in July.

Production figures and comparisons are as follows:

	Steel ingots, castings	Pig iron	Ferro-alloys
Aug., 1942	248,868	162,578	15,961
July, 1942	256,560	172,153	16,718
Aug., 1941	227,075	118,490	18,201
8 mos., 1942 ..	2,064,666	1,308,731	140,522
8 mos., 1941 ..	1,724,316	862,793	136,338
8 mos., 1940 ..	894,639	464,231	84,197

At the end of August, Canadian rated capacity for pig iron, with 12 blast furnaces, was 2,123,320 net tons annually. This will be augmented early in 1943 by completion of 1000-ton furnaces at Sault Ste. Marie, Ont., and Sydney, N. S. Steel furnace capacity Aug. 31 totaled 3,402,000 net tons annually.

A field survey of Argentine resources begun six months ago by the Armour Research Foundation, Chicago, may prove that country to be a source of some of the critical raw materials needed in America's war effort, according to Harold Vagtborg, director. Among the important chemical and mineral products studied and found to be present in practical quantities are beryllium, butyl alcohol or acetone, acetic acid and methanol, and asbestos. Survey was sponsored by Argentine Promotion Corp.

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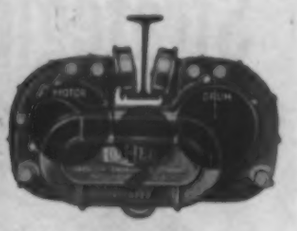

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It is a fact that balance makes a startling difference in electric hoist design.

The Lo-Hed hoist is unusual in that its motor and drum are balanced around the beam. Take a look with us and you'll see what this does. It means that the hook can be pulled up close to the beam—a desirable plus feature for which you pay no premium. It means that since motor and drum are parallel they can be connected through a train of efficient spur gears. The drum, motor and gearing are housed by easily removable covers.

Lo-Hed hoists have many other service and safety features, shown in the 28-page Lo-Hed catalog. No point of manufacture is more vital to you today than the precision with which Lo-Heds are built. Although production has been stepped up, Lo-Heds are as painstakingly made now as they were before the war. On past experience that means good service from a Lo-Hed years after we win. So get a Lo-Hed. Send for that catalog we mentioned.

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Electric Furnace Alloy Steel Made by Open-Hearth Method

PRODUCTION of electric furnace quality alloy steels in an open-hearth furnace is not an easy job, but it is being done successfully by Follansbee Steel Corp. at its Toronto, O., plant.

Alloys containing up to 3.5 per cent nickel, up to 1.75 per cent chromium and up to 0.60 per cent molybdenum are being produced in four 50-ton oil fired open-hearth furnaces. These furnaces are conventional in construction and in operation, except that operating temperatures run around 3050 degrees Fahr., pouring temperatures 2900 degrees Fahr., and the bottoms are made of 100 per cent burnt dolomite. These high temperatures are hard on refractories, but the average lining is good for between 200 and 250 heats, with some lasting as much as 400 heats before requiring major repairs.

The raw material used in the furnaces consists of basic pig iron and alloy scrap. A large part of the scrap used is "home" scrap. Some alloy drops are purchased outside, and alloy turnings are also used. The basic pig-scrap ratio is 50-50.

This scrap supplies part of the alloying elements, the balance being furnished by ferroalloys, virgin nickel, and in some cases the molybdenum is in the form of calcium molybdate. All these are added in the bath.

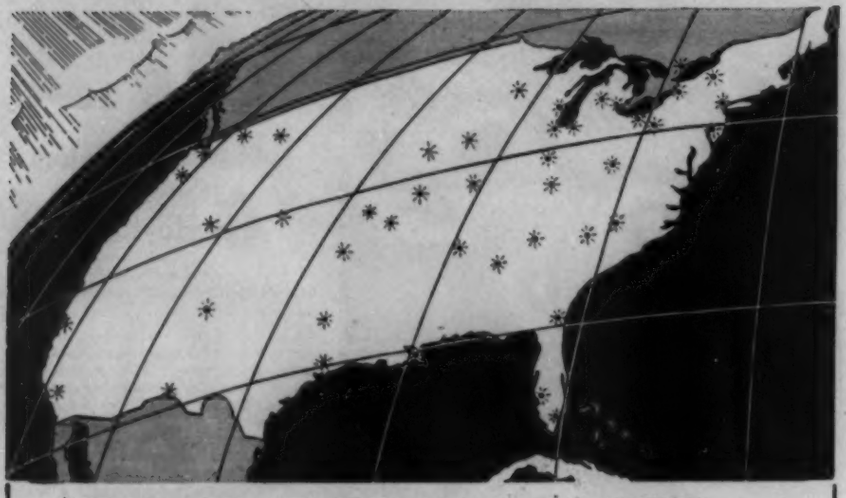
Melting time runs about one to one and one-half hours longer for the alloy steels than for carbon steel produced in the same furnaces. Using aluminum as a deoxidizer, the metal is poured into hot-topped big-end-up ingot molds. Both fluted round and square molds are used, depending on the type of product to be rolled.

Every Step Controlled

Close metallurgical control is evident at every step in the process. The laboratory makes 39 etch tests of each heat of steel before it is shipped. The chief reason for the success of the process is not so much in the metallurgical control, although it is important, as in the furnace practice. The secret is in keeping the steel clean through careful working of the metal. The high temperatures in the furnaces and a heavy slag blanket keep foreign materials out of the bath, while molds and ladles are carefully cleaned and blown out before pouring the ingots in order to eliminate any possible contamination from this source, which might form surface inclusions and defects. A rather unusual furnace practice has been developed, which, together with the particular way the steel is worked in the bath and the control methods used on the slag, accounts for the unusually clean internal structure of the ingots. After cooling, the blooms or billets are carefully chipped and in some cases cleaned with swing grinders before going into cars for shipment.

Four oil-fired reheating furnaces bring the ingots to working temperature before the next step, which is forging. This is the step in which Follansbee has always differed with conventional steelmaking processes, and which has been carried over to the alloy steel production. Instead of a blooming mill operation, Follansbee ingots are pressed on a 1000-ton forging press. The press is also used to crop the ingots, about 25 per cent being removed and scrapped. Billets, blooms and slabs are produced on the press in

Strategic Heating Points



*** SALES OFFICES FOR DRAVO DIRECT FIRED HEATERS . . .**

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L. E. Murray
BIRMINGHAM, ALABAMA
Joseph H. Fox & Co.
BUFFALO, NEW YORK
Steen Fan & Blower Co.
BUTTE, MONTANA
Sullivan Valve and Eng.
CHARLESTON, W. VA.
Engineering Products Co.
CHARLOTTE, N. CAROLINA
Walker and Merck
DALLAS, TEXAS
Rodgers Engineering Co.
DENVER, COLORADO
Harry H. Herman
DES MOINES, IOWA
Delavan Engineering Co.
EL PASO, TEXAS
Boyd Engineering Co.
GRAND RAPIDS, MICH.
W. C. Ladd Co.
GREENVILLE, S. CAROLINA
W. Lindsay Smith
INDIANAPOLIS, INDIANA
Air Control, Inc.
HOUSTON, TEXAS
D. A. Brown Company
KANSAS CITY, MISSOURI
H. H. Wright
LOS ANGELES, CALIF.
H. F. Haldeman, Inc.
LOUISVILLE, KENTUCKY
Brandeis Machinery & Supply
MEMPHIS, TENNESSEE
Southern Sales Co.
MILWAUKEE, WISCONSIN
Roloff Engineering Co.
MINNEAPOLIS, MINN.
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Cressy and Legett
OKLAHOMA CITY, OKLA.
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C. J. Brassell
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GLOBAL war tempo calls for speedy, authoritative answers to essential heating problems. At these strategic locations are men who can fit Dravo Direct Fired Heaters to your specific need and give you estimates and engineering data—quickly!

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PITTSBURGH, PENNA.
Dravo Building

sections from 8 to 12 inches in thickness. Further reduction, if necessary, is accomplished on a reversing bar mill which reduces to a 4-inch section. The alloy steels are sold in the form of semifinished material, largely billets, although some slabs and blooms are furnished, particularly on export orders.

Coming off the mill at 1600 degrees Fahr., the steel is transferred to cooling pits. There are 14 of these units, where the cooling process can be closely controlled to meet the requirements of the customer.

Although this material is being used only in the war effort and thus must pass stringent inspection by our armed forces, as well as other lend-lease nations, rejects are unusually small, running as low as one-half of 1 per cent in some heats.

companies.

Officers elected: Chairman, H. G. Grim; vice chairman, Dr. F. H. Allison; secretary, F. C. T. Daniels, 901 Bingham street, Pittsburgh; treasurer, R. C. Heaslett; executive committee, George S. Baldwin, H. E. Bowie, Walter H. White, J. S. Zahn, J. L. Nichols, E. H. Harder, E. H. Nebs, W. E. Harvey, Herman F. Rassbach.

Member companies include: Atlantic Steel Castings Co., Chester, Pa.; Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; Continental Roll & Steel Foundry Co., East Chicago, Ind.; Detroit Steel Castings Co., Detroit; The Falk Corp., Milwaukee; Lukens Steel Co., Coatesville, Pa.; Blaw-Knox Co., Carnegie-Illinois Steel Corp., Heppenstall Co., United Engineering & Foundry Co., Mackintosh-Hemphill Co., McConway & Torley Co., Mesta Machine Co., all of Pittsburgh; The Midvale Co., Nicetown, Pa.; National Roll & Foundry Co., Avonmore, Pa.; Ohio Steel Foundry, Lima, O.; Railway Steel Spring Division American Locomotive Co., Latrobe, Pa.; John A. Roebling's Sons Co., Trenton, N. J.; Standard Steel Works Division Baldwin Locomotive Works, Burnham, Pa.

MEETING

American Gear Manufacturers Association: Program for the twenty-fifth semiannual meeting at Skytop Lodge, Skytop, Pa., follows:

Thursday, October 15

9:30 a.m.

Address by J. H. Flagg, president A.G.M.A. and committee meeting and reports.

2:05 p.m.

"The Substitution of Materials As a Necessary Aid to the War Effort," by E. J. Wellauer, Supervisor of Research and Metallurgy, Falk Corp.

6:30 p.m.

Dinner.

Friday, October 16

9:30 a.m.

Committee Reports—Technical and Commercial. "War Time Production of Gearing for the Aircraft Industry," by P. W. Brown, Assistant Works Manager, Wright Aeronautical Corp.

2:00 p.m.

Technical Committee and Commercial meetings.

7:30 p.m.

Semiannual A.G.M.A. dinner.

Saturday, October 17

9:30 a.m.

Committee Reports.

American Society of Mechanical Engineers: H. V. Coes, vice president of Ford, Bacon & Davis Inc., New York, has been elected president of the society and will be installed during the sixty-third annual meeting, Hotel Astor, New York, Nov. 30-Dec. 4.

—o—

National Chemical Exposition: A feature exhibit at the exposition, Sherman hotel, Chicago, Nov. 24-29, will be micrographs contributed by 40 laboratories using the electronic microscope.

—o—

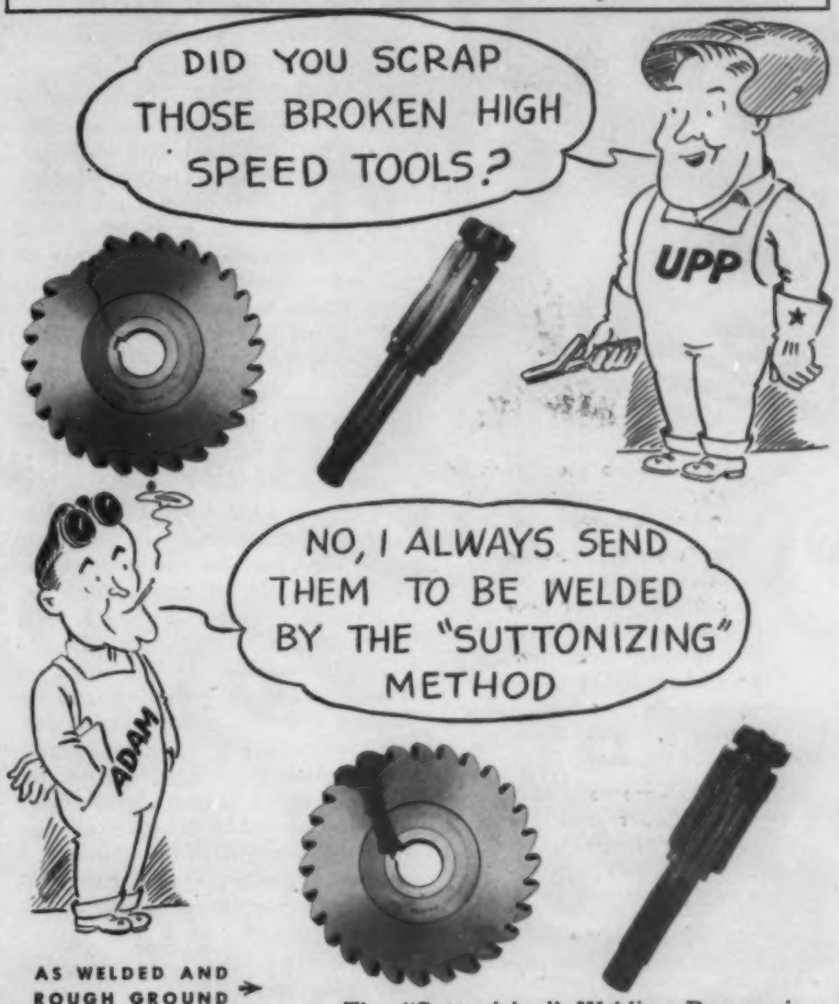
American Society of Mechanical Engineers: Fall meeting will be held at the Sagamore hotel, Rochester, N. Y., Oct. 12-14. Twenty-six papers are scheduled for presentation.

Automotive Advertisers Council: Fall meeting at the Sherman hotel, Chicago, Oct. 19-21, has been keyed to the many sided subject of advertising during war-time.

Acid Open Hearth Research Association Organized

Acid Open Hearth Research Association organized recently has announced the appointment of Dr. G. R. Fitterer, department of metallurgy, University of Pittsburgh, as director of research, and J. W. Linhart as research metallurgist. Work will be conducted by Dr. Fitterer under auspices of the University of Pittsburgh, in conjunction with full study of actual furnace heats in plants of member

UPP and ADAM *Broadcast No. 1001* • • *by* Mason-Hahn


DID YOU SCRAP THOSE BROKEN HIGH SPEED TOOLS?
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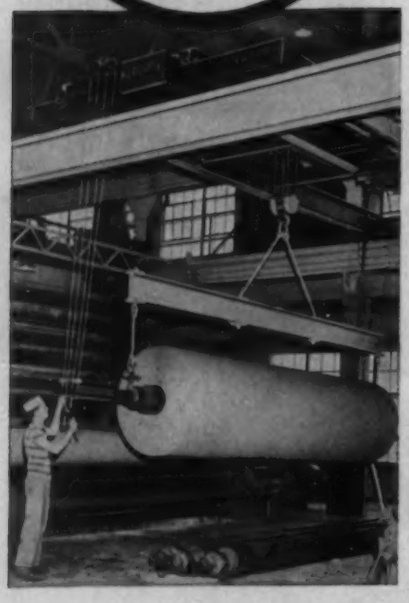
NO, I ALWAYS SEND THEM TO BE WELDED BY THE "SUTTONIZING" METHOD
ADAM
AS WELDED AND ROUGH GROUND

Wire or write for our catalog today—it shows you typical examples of tools that have been reclaimed by "Suttonizing" such as Reamers, Broaches, Taps, Form Cutters, Drills, Hobs, Lathe Centers, Turning Tools, End Mills, etc.

The "Suttonizing" Welding Process is a new method that can be applied only in our plant. Tools sent to us can be repaired and returned promptly without *post heat treatment* in the majority of cases. Why not take "Upp and Adam's" advice and send us your broken high speed tools, hundreds of others do and are well satisfied.

WELDING EQUIPMENT & SUPPLY CO.
220 Leib Street • DETROIT, MICHIGAN

How to KILL OFF Maintenance Hours!



Here is more proof that it pays to *standardize* on Reading Cranes!

The five-ton installation shown here is one of *six* Reading Cranes at work in this paper mill. With capacities ranging from five to fifteen tons—they are doing a really good job of keeping tough production schedules intact.

When *you* want to cut maintenance hours and get safer, faster handling . . . it will pay you to rely on Reading's engineering ability.

JUST OFF THE PRESS—"The Why and How of Faster Production at Lower Cost", a 16-page catalog complete with photos of Reading Cranes, parts and finished installations. A note on your company letterhead will start a free copy on its way to your desk.

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READING
Chain Hoists, Electric Hoists, Cranes and Monorails

"Pleasant Trip?" Then I Tell 'Em!

DETROIT

FOLLOWING verbatim report by an ex-automobile salesman turned "expediter" for war materials at the Cadillac plant in Detroit is typical of the daily routine of these busy individuals in the current pressure for production:

Tuesday

11:50 a.m.—Receive assignment at Detroit; get 25 pieces part C-105774 (machined forgings) to factory by Saturday morning from Company "Y," Waukesha, Wis. Forgings from Company "X," Milwaukee. Forgings not started.

1:16 p.m.—On plane to Chicago; through service by plane to Milwaukee not available until late evening. No time to pack baggage. Had traffic department reserve space; no time to check on results. Drove personal car to airport, left it in charge of attendant, with keys, and instructions to turn over to wife later. Could not locate wife. Located mother-in-law. Left message to pick up car. Caught plane with two minutes to spare.

2:15 p.m.—Arrive Chicago airport. Taxi 13 miles to Northwestern station in 20 minutes.

4:45 p.m.—Arrive Company "X" in Milwaukee. Contact general manager, assistant general manager and purchasing agent. Sell them on immediate action. Hammer available; promise to forge 800 pieces same evening. Arrange to clear heat-treating furnace to take first 150 forgings immediately as they are hammered. Arrange for truck to pick up forgings at 11:00 a.m. next day for shipment to Company "Y." Phone Company "Y," explain problem, stress job the forging company is doing to get work finished. Advised by them it would take another week to fabricate regardless of circumstances. Finally agreed to do all possible in way of preparation and to sleep on problem.

7:30 p.m.—Forgings hammered and on way to heat treat.

8:00 p.m.—Dinner.

Wednesday

8:00 a.m.—At forge shop. Sold organization on picking up warehouse steel to complete our run. Assure self of heat treat progress, recheck truck, packaging weight, etc.

10:00 a.m.—Taxi 13 miles to Company "Y"—took along one forging, not heat treated, to assist shop men in setting up and tooling, arranging sequence of opera-

"General Grants"—
THEY'RE TOUGH, FAST AND HARD HITTERS!

Challenged by an aggressive enemy with years of war machine building experience, American engineers, in record time, designed, tested and built the famed "General Grant" tanks. Heavily gunned, tough and fast in the field, these steel monsters can out-fight, out-shoot and outmaneuver anything the Axis powers have yet rolled out.

But it takes water to build tanks—water for the men who work in the plants—for those who produce the steel for those who operate and service them—and for millions of other people in the Service of Supply. Before plants could be built, armies trained and munitions made, there had to be an abundance of water. Upon the old, reliable and capable shoulders of the Layne Organization fell much of the task of producing that water. Layne swung into action and in record time, built deep well water systems by the hundreds, thus making possible unprecedented war and production programs.

Layne's reputation like that of the "General Grant" tanks, has been won on the field of action. Layne wells and pumps are doing an outstanding job—operating day and night, producing millions and millions of gallons of water for almost every phase of America's war effort. For late bulletins, wire or write LAYNE & BOWLER, INC., Memphis, Tenn.

LAYNE PUMPS & WELL WATER SYSTEMS

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Louisiana Well Company.....Monroe, La.
Layne-New York Company.....New York City
Layne-Northwest Company.....Milwaukee, Wis.
Layne-Ohio Company.....Columbus, Ohio
Layne-Texas Company.....Houston, Texas.
Layne-Western Company.....Kansas City, Mo.
Layne-Western Co. of Minn.....Minneapolis, Minn.
International Water Supply, Ltd...London, Ont.

WORLD'S LARGEST WATER WELL SYSTEM

tion. They had never machined this forging previously.

11:00 a.m.—Discussion with general manager, superintendent, shopmen. Result: Forging can be machined quickly with screw machine, making several operations at once. Still the probem of second heat treat (15 hours) and major job of finding furnace available at right time. Am told that with plenty of luck I might get a few by Sunday. Still not good enough. Phone plant at Detroit. Shop men, aroused, leave for plant to lay out better plans. Come back with new plan which will get a few pieces out early Saturday. Call several heat treaters. Locate two who say they may have furnaces open. Promise job to both. Call forge plant on details. Arrange for ordnance inspection immediate release. Take interurban to Milwaukee. Contact ordnance inspector and get his support in case release does not come over teletype. Check Company "Y" on progress of machining. All men to work 24 hours a day. Job progressing beyond expectations.

Thursday

70 pieces finished three hours ahead of schedule. Receive OK on inspection release. Check truck to Milwaukee railroad station.

Friday

8:00 a.m.—Pieces come out of heat treat 10 hours ahead of earlier schedule.

12 noon.—Check at Company "Y." Find grinding started during lunch hour, with four hours for cooling pieces. On truck at 4 p.m. Ride truck to Milwaukee, arriving 5 p.m. Check pieces onto express car. Make copy of express bill and note car number, just in case. Route shipment via Pennsylvania out of Chicago to save transfer time and possible complications on receiving end.

6:00 p.m.—Take train to Chicago, arriving at 7:15 p.m. Stay with shipment until deposited in express car. Note car number and request express company to wire Detroit to hold first express truckload for this shipment.

8:30 p.m.—Dinner and sleeper to Detroit.

Saturday

8:00 a.m.—Arrive Detroit. Check shipment onto express truck direct to plant.

8:30 a.m.—Arrive factory. Check shipment at receiving department.

9:00 a.m.—Office force wants to know if I enjoyed plane trip to Chicago. I tell them.

Dollar volume of plant construction in the Chicago area for September totaled $25,195,000, which compares with $8,896,000 for the same month in 1941.

"No Better Boss Than United States Army"

The Army is a good "boss". . That's the opinion expressed by Duncan W. Fraser, president, American Locomotive Co., following a recent visit to the company's Schenectady, N. Y., plant by Lieut. Gen. Brehon B. Somervell, head of the United States Army Services of Supply.

"I would like to get the record straight on that point," Mr. Frazer said, "because I have heard that Germany's Mr. Goebbels would like to have the American people believe that the opposite is true. The fact of the matter is that we have never had a better boss than the United States Army. The Army men with whom we have had contact know their business from A to Z. They are quick, hard-driving and efficient.

"When the Army asked us to change over from building M-3 tanks to building the new M-4's and to speed up production still further, they understood the problem and they pitched in . . . to get the necessary buildings and facilities. The Army builds as well as it fights."

7-Foot High Heat Exchanger Meets New Requirements

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Heat-Resistant and Corrosion-Resistant ALLOY CASTINGS

● This pressure-tight cast and welded heat exchanger is another example of MICHIANA adaptability. It consists of centrifugally cast tubes with statically cast return bends to form a complete seven-foot high pressure-tight chamber of special heat-resistant alloy. It performs an important function in the processing of one of the new light-weight metal industries, vitally connected with our War effort.

For new developments or routine jobs, you can depend on MICHIANA recommendations and be sure of long heat-hour performance.

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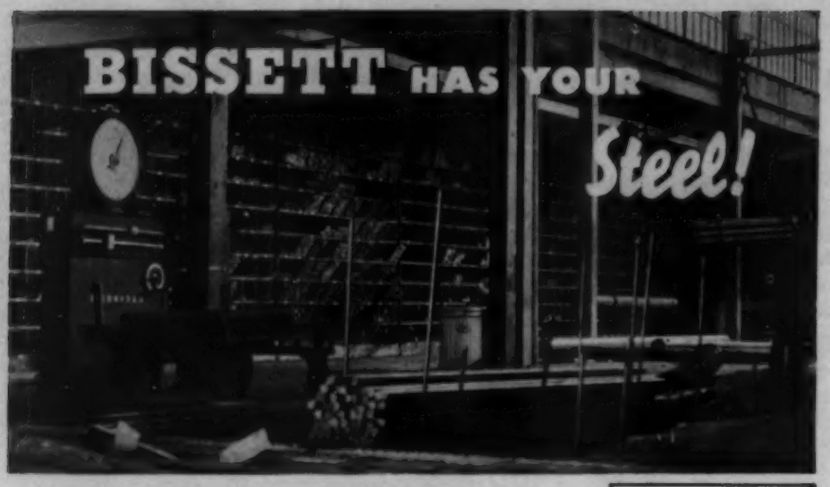
MICHIGAN CITY, INDIANA



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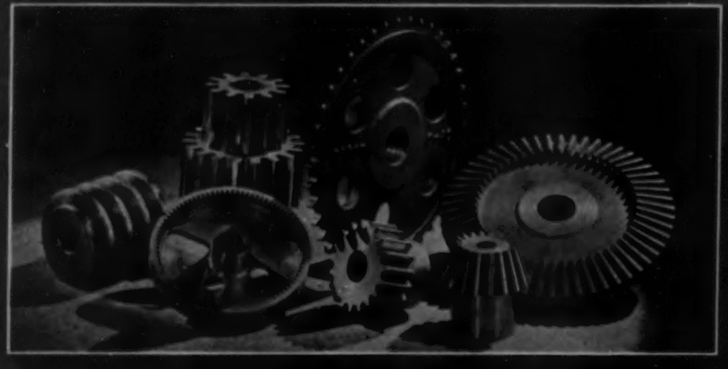

GRANT

GEARS Sizes ¼" to 72"—Spur—Bevels—Mitres—Helicals—Worms & Worm Gears—Sprockets—Reduction Units. Also Special Gears. Over Sixty Years Manufacturing Experience.

GRANT GEAR WORKS — BOSTON, MASS.

Activities of Steel Users and Makers

OVER 200 carbide tool specialists, "carbide supervisors," were trained for 100 major United States industrial concerns during the first six months of 1942 at the training school operated by Carboloy Co. Inc., Detroit, according to K. R. Beardslee, sales manager. Course was designed for advanced training of men who will have complete responsibility for all phases relating to the design, application and care of carbide cutting tools.

—o—

Purpose of a new house organ published monthly by employes of the Marmon-Herrington Co., Indianapolis, Ind., is "to promote greater comradeship among the employes" and to broaden their knowledge of the common activities in various departments of the company. The *News*, first issue of which is dated September, contains many illustrations of employes. An article on formation of a share-a-ride club and the need for car pooling is given important space and another page is devoted to stimulating employe ideas to "Axe and Axis." Recent changes in the executive management also are featured.

—o—

Libbey-Owens-Ford Glass Co., Toledo, O., has turned over to the government for use in building bombers its stock of 82,233 pounds of aluminum. The aluminum originally was fabricated for decorative store fronts. In its present fabricated form it is valued at $52,451, but under the government basis of valuation, company will receive $19,922.

—o—

Scott-Tarbell Co. has been formed in Cleveland as a distributor of welding supplies in northern Ohio. Company will act as jobber for products of Allis-Chalmers Co., Weld-O-Tron, Victor Equipment Co., Tweco Products Co. and Una Welding Inc., with a line including alternating current welders, welding and cutting torches, electrodes, holders, clamps, cable connectors and related equipment. Ray Tarbell, formerly of Una Welding Inc., and Ed Scott, president, Cleveland School of Welding, are associated in the business.

—o—

In continuous publication for over 50 years, *Pittsburgh Plate Products*, company publication of the Pittsburgh Plate Glass Co., appeared in July-August as a golden anniversary edition. The house magazine is one of the oldest of its kind in the country. First christened *Patton's Monthly*, it was established in 1892 to spread the name and reputation

of the Patton Paint Co., Milwaukee, and its "Sun-Proof" paints. This concern later became the paint division of Pittsburgh Plate Glass Co., and in 1933 the publication was renamed.

—o—

Independent Pneumatic Tool Co., Chicago, manufacturers of pneumatic and electric tools, has announced new locations of its branch offices. Boston office, now managed by Vance G. Turner, has moved to 78 Brookline avenue, and the Birmingham, Ala., office has moved into a new building at 1411 North Third avenue.

Chicagoan Designs Machine To Salvage Cans at Dumps

In a number of American cities, Chicago as an example, refuse and garbage are thrown together to be collected by city trucks and hauled to dumps. Normally, the refuse includes tin cans which housewives now are asked to prepare and keep separate for detinning. Not all housewives are co-operating, however, and quantities of cans still reach dumps where no means are available for salvaging them.

Contemplating this loss, Thomas A. Kohler, 7951 Langley avenue, Chicago, proposes a method for effecting salvage and has designed on paper portable equipment which would accomplish this at the dump site.

The garbage, instead of being unloaded directly into the dump, would discharge into a trough for gravity flow. Mr. Kohler's proposed machine, straddling the trough, would pull the cans from the garbage with a rotating cylindrical electromagnet, deposit them on a mechanical conveyor, remove the ends including the seams, cut out the longitudinal soldered seam, and discharge the remainder for shipment to the detinning plant.

Claims for the machine are that it would increase collection of cans with profit to the city, increase the amount of recoverable tin, and provide to steel mills detinned scrap without tin concealed in seams and contaminating to the melt.

Standard Oil To Save Tin By Bottling Many Products

Tin plate saved through substitution of glass bottles for tin cans in packaging certain petroleum products and lubricants will amount to 255 tons a year for the war effort, according to Standard Oil Co. of Indiana, Chicago. Company's plan of bottling sprays, polishes, cleaners, waxes, etc., is directed at saving the equivalent in tin plate of 2,000,000 No. 2 ration cans.

LEWIN-MATHES *Got the right answer at*

ETNA

They had a job of pointing heavy-walled copper tubing, and wanted to speed up the operation. Just how to do it didn't appear on the horizon, and so Lewin-Mathes did the safe and logical thing—they put their swaging job up to Etna.

The answer to that problem is illustrated on this page. It's a modern Etna Swaging Machine that points *more* copper tubes per hour in less time at less cost. If you have a problem involving tapering or reducing tubing and solid rounds—ask Etna about it.

Etna has the swaging machines from ⅜" to 4" and the experience to help you get the most out of this type of machine.

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING... "Ask ETNA About Swaging"

ETNA MACHINE COMPANY
TOLEDO OHIO

FINDING ROADS—OR *BUILDING TANKS* ...LOCAL BOYS KNOW THE SHORT CUTS!

PURDY'S KNOWLEDGE of steel problems carries right through to production practice itself. Because they are localized in the use of steel, Purdy men are often able to recommend quick short-cuts to replace slower methods—and they've got the help of the complete line of PLANET tool steels, cold-drawn steels, drill rod and spring steels to put them into practice. If you've got a problem in steel that requires unusual ingenuity, bring it to Purdy for prompt action.

A. R. PURDY CO., Inc.,
792 Greenwich St., New York, N. Y.

PLANET Tool Steels are one Purdy product to speed production. Complete stock includes:

"PLANET BEST" Water Hardening Steel ● "PLANET CHOICE AX" Water Hardening Steel ● "PLANET TRUFORM" Oil Hardening Steel ● "SCALE PIVOT STEEL"

PLANET

PURDY

War steels PLUS *Know how*

Contracts Awarded To Small Companies

APPROXIMATELY $6,000,000 worth of war contracts have been awarded to small businesses in the past fortnight through the efforts of the WPB Smaller War Plants Division, according to Frank Smith, head of the engineering section of the division.

"About two weeks ago," Mr. Smith said, "we learned that the Chemical Warfare Service was about to place orders for a large number of incendiary bombs of an entirely new type, requiring new tooling throughout. There was no reason, therefore, why these contracts could not be placed with firms who had never done this sort of work before and we were confident we could provide such facilities. The procurement people were willing to let us share in this order.

"Two orders of about equal size have been placed, one in Providence, R. I., and the other in Louisville, Ky. The total of these two contracts is about $4,500,000. In both cases we have selected to take the prime contract a firm which does not have facilities for fabricating the parts of the bombs. These firms will assume responsibility for final inspection of the parts and will do the assembly job. Then we found in the immediate vicinity a half dozen or so small shops suitably equipped and capable of making all of the component parts.

Called in Prime Contractors

"We called the prospective prime contractors to Washington and went over the whole business with them, indicating the subcontractors who we knew were able to make all the parts. The prime contract was offered only on condition that the parts would be subcontracted, although in this particular case the prime contractors had no facilities for fabrication. We were able to indicate most of the subcontractors.

"Similarly, we recently learned of a contract for gasoline pumps to be let by the Navy Department amounting to about $125,000 per month for a year, or a total of $1,500,000. This contract we were able to place with a firm in Oklahoma which had been manufacturing equipment for public service corporations. Obviously, this business had been very seriously hit by the almost complete stoppage of new construction in this field. This firm is acting as prime contractor, using 20 subcontractors in the immediate vicinity. In this instance, we had less to do with the selection of subcontractors as the public service equipment company had already formed the group of subcontractors."

Here's why
CLEVELANDERS PREFER
THE CLEVELAND
...AND WHY TRAVELERS
AGREE WITH THEM •
★

A genuine interest in your comfort by everyone from manager to doorman.

Food that has made our four restaurants famous.

Deep beds, crisp linen, modern furnishings planned for comfort.

Gaymusic for dancing, or calm quiet if you prefer.

Convenience that saves time and money. Hotel Cleveland adjoins the Union Terminal and Terminal Garage, and is next door to everything you'll want to see in Cleveland.

HOTEL CLEVELAND
Cleveland

Control Over Lakes Shipping Extended

EXISTING permit system of the Office of Defense Transportation, applying to certain types of Great Lakes vessels, soon will be extended to control the movement of virtually all commercial craft operating on the Lakes.

Extension of the permit system will allow the ODT to put into effect a new schedule of domestic shipping priorities recently transmitted as a directive to ODT by the War Production Board. The revised priority schedule, made effective Sept. 11 by WPB Certificate of Necessity for Priority Action No. 2, was formulated to assure ample cargo space for the preferential movement of iron ore on the Great Lakes, as well as to assure the movement of other commodities essential to the war effort.

The certificate directs the ODT to execute transportation priorities which give to iron ore moving in ODT-certified ore carriers an A-1 rating; to coal, coke and other commodities transported in certain types of vessels an A-2 rating, and to other items various lower ratings. It requires conformity to the WPB priority ratings for bulk commodity movement.

Revision of the priorities schedule and extension of the ODT permit system was made necessary by increases in estimates of the volume of iron ore which must be shipped from mines.

Ore Requirements Higher

General Orders ODT Nos. 8 and 9, restricting movement of grain and coal on the lakes, were issued in May and June to make available cargo space to transport an expected season total of approximately 89,500,000 tons of iron ore. With the progress of war production, however, this total has come to be considered merely a minimum goal with the result that further curtailment of less essential shipping on the Great Lakes is considered necessary.

An ODT general order, to be issued soon, will require that no person shall operate any vessel on the Great Lakes except in such manner as may be authorized by general or special ODT permit. The order will give the ODT virtually complete control over all American Great Lakes vessels of 1000 or more gross tons.

In defining preferential classes of commodities, the revised priorities schedule recognizes that "the application of all ratings is subject to the practical exigencies of loading and scheduling operations, which are matters entirely for the Office of Defense Transportation."

Acceleration of materials handling tempo puts the spotlight on *safety*. Krane Kar's ease of operation, stability, unobstructed vision, full traction, and other safety features provide maximum manpower protection 168 hours a week. Send for illustrated Bulletin 55, for complete details.

Among the Users: American Smelting & Refining; United Engineering & Foundry Co.; Basic Magnesium; Lockheed Aircraft; Bethlehem Steel; Carnegie-Illinois Steel; Hercules Powder; DuPont de Nemours; Follansbee Steel Corp.; General Motors; Keystone Steel & Wire; General Electric; etc.

Kranekar SWING BOOM TRACTOR CRANE 2½, 5 & 10 TON CAPACITIES

SILENT HOIST WINCH & CRANE CO., 849 63RD ST., BROOKLYN, N.Y.

ACE

RUBBER LINED

TANKS • PUMPS • PIPE • FITTINGS
VALVES • SEWERS • FUME DUCTS

Prevents Corrosion

AMERICAN HARD RUBBER COMPANY
NEW YORK AKRON CHICAGO

THE TOMKINS-JOHNSON CO., Jackson, Michigan, U. S. A.

Top Rate Steel Output Falls Short of War Needs

DEMAND
Greater than production.

PRODUCTION
Continues at 98 per cent.

PRICES
Ceilings are maintained.

Mill books loaded with top ratings. . . Scrap drive bringing results. . . Bars now tighter than plates, sheets also scarce. . . . Second billion tons Lake Superior iron ore reached in September

PRODUCING steel at the highest rate possible, keeping all usable equipment at its greatest practical activity, the industry continues unable to meet the unprecedented demand imposed by war and essential civilian needs.

Best possible distribution of output is being accomplished by allocations and directives but pressure continues to concentrate orders into the topmost ratings, with tonnages bearing lower priorities standing little chance of getting on rolling schedules. More and more, mill books carry an excess of AA-1 and AA-2 ratings. As a result of this condition manufacturers of war goods occasionally are forced to diminish their activities for lack of material, though on the whole supply is kept up for the most essential. Warehouses are not being supplied sufficient steel to meet needs for small lots to fill in consumer requirements. Some relief is being obtained through material in frozen stocks recently released by WPB.

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Early reports of progress indicate that the nation-wide scrap drive is achieving results and effects are being felt in numerous areas where receipts are sensibly increased, easing the situation and in some cases providing sufficient for small accumulations. War Materials Inc., just getting into action, is relied on to loosen an important tonnage from situations where cost of salvage or other considerations prevented its movement. With funds for financing such cases a great deal of obsolete material will be recovered. Search is rapidly assuming a house to house aspect as public appreciation of the situation increases.

Minor fluctuations in steel production last week failed to change the overall situation and the national rate remained at 98 per cent, for the sixth week. Pittsburgh advanced 1 point to 96½ per cent and Wheeling 4½ points to 85. Cleveland lost 1 point to 92½ per cent, Cincinnati 4 points to 88, St. Louis 1 point to 91 and Detroit 2 points to 93. Rates were unchanged at Chicago, 102½ per cent; Buffalo, 90½; Youngstown, 95; eastern Pennsylvania, 96; Birmingham, Ala., 95; New England, 100.

Tin plate producers expect the major part of their product in first half will be from the electrolytic lines now going into operation. One such line already is producing and others are close to completion. Price has been unofficially set at $4.50 per base box, 50 cents under standard hot-dipped plate. Quotas of black plate are not sufficient to keep platers at expected rate of activity, probably not reaching more than 50 per cent of rated capacity for last half.

Tightness is increasing in steel bars, both hot and cold-rolled. Quotations now are almost exclusively for December and in case of flats and large rounds most promises are for first quarter, even on top ratings. Much current production is on allocations and adoption of a system similar to that which has proved successful in plates may be a solution. For the most part plate deliveries are moving smoothly, consumers being supplied with sufficient tonnage as they need it. Tonnage carried over into the next month is being reduced and mills are coming closer to rolling their entire quotas each month. Heavy sheared plates are still somewhat short but the situation is not interfering with production.

Sheet production is limited by allocations of semifinished steel under the quota plan and much of the output is covered by direct allocation for definite projects. Bomb requirements call for considerable tonnage of sheets. Galvanized sheets are especially tight. Few mills can promise even tentative deliveries on ratings under AA-2 and in most cases these promises run to mid-December. This is caused by substantial direct allocations by Washington and further rerating of old orders.

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Effect of restrictions on use of structural shapes in construction is shown by American Institute of Steel Construction statistics. The fabricating industry booked only 73,541 tons in August. This contrasts with 158,658 tons in the same month a year ago. Fabricators are turning largely to other lines, including prefabricated parts for ships and similar work. Subcontracting of such parts is on the increase. Many projects are being redesigned for concrete and timber, to save steel. Considerable tonnage is expected to come out as the synthetic rubber program develops.

Rapid growth of the steel industry in the United States is shown by completion of shipment of the second billion tons of Lake Superior ore in September, 22 years after the first billion had been shipped. The first billion required 66 years, the second only a third of that time.

Ceiling prices ruling in steel and iron products the composite prices are unchanged. Finished steel composite is $56.73, semifinished steel $36.00, steelmaking pig iron $23.05 and steelmaking scrap $19.17.

COMPOSITE MARKET AVERAGES

	Oct. 3	Sept. 26	Sept. 19	One Month Ago Sept., 1942	Three Months Ago July, 1942	One Year Ago Oct., 1941	Five Years Ago Oct., 1937
Finished Steel	$56.73	$56.73	$56.73	$56.73	$56.73	$56.73	$62.18
Semifinished Steel	36.00	36.00	36.00	36.00	36.00	36.00	40.00
Steelmaking Pig Iron	23.05	23.05	23.05	23.05	23.05	23.05	22.84
Steelmaking Scrap	19.17	19.17	19.17	19.17	19.17	19.17	16.00

Finished Steel Composite:—Average of industry-wide prices on sheets, strip, bars, plates, shapes, wire, nails, tin plate, standard and line pipe. **Semifinished Steel Composite:**—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. **Steelmaking Pig Iron Composite:**—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City and Youngstown. **Steelworks Scrap Composite:**—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	Oct. 3, 1942	Sept. 1942	July 1942	Oct. 1941
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.15c
Steel bars, Chicago	2.15	2.15	2.15	2.15
Steel bars, Philadelphia	2.49	2.49	2.49	2.47
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.22	2.22	2.22	2.22
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.10	2.10	2.10	2.10
Plates, Philadelphia	2.15	2.15	2.15	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.10	2.10	2.10	2.10
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.10	2.10	2.10	2.10
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Gary	3.50	3.50	3.50	3.50
Bright bess., basic wire, Pittsburgh	2.60	2.60	2.60	2.60
Tin plate, per base box, Pittsburgh	$5.00	5.00	5.00	5.00
Wire nails, Pittsburgh	2.55	2.55	2.55	2.55

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods No. 5 to 7/16-inch, Pittsburgh	2.00	2.00	2.00	2.00

Pig Iron

	Oct. 3, 1942	Sept. 1942	July 1942	Oct. 1941
Bessemer, del. Pittsburgh	$25.19	$25.19	$25.19	$25.34
Basic, Valley	23.50	23.50	23.50	23.50
Basic, eastern, del. Philadelphia	25.39	25.39	25.39	25.34
No. 2 fdry., del. Pgh., N.&S. Sides	24.69	24.69	24.69	24.69
No. 2 foundry, Chicago	24.00	24.47	24.47	24.22
Southern No. 2, Birmingham	20.38	20.38	20.38	20.38
Southern No. 2, del. Cincinnati	24.30	24.30	24.30	24.06
No. 2X, del. Phila. (differ. av.)	26.265	26.265	26.265	26.215
Malleable, Valley	24.00	24.00	24.00	24.00
Malleable, Chicago	24.00	24.00	24.00	24.00
Lake Sup., charcoal, del. Chicago	31.54	31.54	31.54	31.34
Gray forge, del. Pittsburgh	24.19	24.19	24.19	24.19
Ferromanganese, del. Pittsburgh	140.65	140.65	140.65	125.33

Scrap

Heavy melting steel, Pitts.	$20.00	$20.00	$20.00	$20.00
Heavy melt. steel, No. 2, E. Pa.	18.75	18.75	18.75	17.75
Heavy melting steel, Chicago	18.75	18.75	18.75	18.75
Rails for rolling, Chicago	22.25	22.25	22.25	22.25
No. 1 cast, Chicago	20.00	20.00	20.00	20.00

Coke

Connellsville, furnace, ovens	$6.00	$6.00	$6.00	$6.25
Connellsville, foundry, ovens	7.25	7.25	7.25	7.25
Chicago, by-product fdry., del.	12.25	12.25	12.25	12.25

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Following are maximum prices established by OPA Schedule No. 6 issued April 16, 1941, revised June 20, 1941 and Feb. 4, 1942 The schedule covers all iron or steel ingots, all semifinished iron or steel products, all finished hot-rolled, cold-rolled iron or steel products and any iron or steel product which is further finished by galvanizing, plating, coating, drawing, extruding, etc., although only principal established basing points for selected products are named specifically. All seconds and off-grade products also are covered. Exceptions applying to individual companies are noted in the table.

Semifinished Steel

Gross ton basis except wire rods, skelp.

Carbon Steel Ingots: F.o.b. mill base, rerolling qual., stand. analysis, $31.00.
(Empire Sheet & Tin Plate Co., Mansfield, O., may quote carbon steel ingots at $33 gross ton, f.o.b. mill.)

Alloy Steel Ingots: Pittsburgh base, uncropped, $45.00.

Rerolling Billets, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $34.00; Detroit, del. $36.25; Duluth (bil.) $36.00.
(Wheeling Steel Corp. allocated 21,000 tons 2" square, base grade rerolling billets under lease-lend during first quarter 1942 at $37, f.o.b. Portsmouth, O.; Andrews Steel Co. may quote carbon steel slabs $41 gross ton at established basing points.)

Forging Quality Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $40.00; Detroit, del. $42.25; Duluth, $42.00.
(Andrews Steel Co. may quote carbon forging billets $50 gross ton at established basing points.)

Open Hearth Shell Steel: Pittsburgh, Chicago, base 1000 tons one size and section: 3-12 in., $52.00; 12-18 in., $54.00; 18 in. and over, $56.00.

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $54.00.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $34.00.
(Empire Sheet & Tin Plate Co., Mansfield, O. may quote carbon steel sheet bars at $39 gross ton, f.o.b. mill.)

Skelp: Pittsburgh, Chicago, Sparrows Pt., Youngstown, Coatesville, lb., $1.90.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, No. 5—9/32 in., inclusive, per 100 lbs., $2.00.

Do., over 9/32—47/64-in., incl., $2.15. Worcester add $0.10 Galveston, $0.27. Pacific Coast $0.50 on water shipment.

Bars

Hot-Rolled Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, base 20 tons one size, 2.15c; Duluth, base 2.25c; Detroit, del. 2.27c; New York del. 2.51c; Phila. del. 2.49c; Gulf Ports, dock 2.52c, all-rail 2.59c Pac. ports, dock 2.50c; all rail 3.25c.
(Phoenix Iron Co., Phoenixville, Pa., may quote 2.35c at established basing points.) Joslyn Mfg. Co. may quote 2.35c, Chicago base, Calumet Steel Division, Borg Warner Corp., may quote 2.35c, Chicago base, on bars produced on its 8-inch mill.)

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.
(Sweet's Steel Co., Williamsport, Pa., may quote rail steel merchant bars 2.35c f.o.b. mill.

Hot-Rolled Alloy Bars: Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 2.70c Detroit, del. 2.82c.

S.A.E.	Alloy Diff.	S.A.E.	Alloy Diff.
2000	0.35	5100 Spr. flats	0.15
2100	0.75	5100 80-1.10 Cr	0.15
2300	1.70	6100 Bars	1.20
2500	2.55	6100 Spr. flats	0.85
3100	0.70	Carb., Van.	0.85
3200	1.35	9200 Spr. flats	0.15
3300	3.80	9200 Spr. rounds, squares	0.40
3400	3.20	T 1300, Mn, mean 1.51-2.00	0.10
4100 .15-25 Mo.	0.55	Do., carbon under 0.20 max.	0.35
46.00 .20-.30 Mo. 1.50-2.00; Ni.	1.20		

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 20,000-39,999 lbs., 2.65c; Detroit 2.70.

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 3.35c; Detroit, del. 3.47c.

Turned, Ground Shafting: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base (not including turning, grinding, polishing extras) 2.65c; Detroit 2.72c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base 2.15c; Detroit del. 2.27c; Gulf ports, dock 2.52c, all-rail 2.61c; Pacific ports, dock 2.80c, all-rail 3.27c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, base 2.15c; Detroit, del. 2.27c; Gulf ports, dock 2.52c, all-rail 2.61c; Pacific ports, dock 2.80c, all-rail 3.25c.
(Sweet's Steel Co., Williamsport, Pa., may quote rail steel reinforcing bars 2.35c, f.o.b. mill.

Iron Bars: Single refined, Pitts. 4.40c, double refined 5.40c; Pittsburgh, staybolt, 5.75c; Terre Haute, common, 2.15c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Pt., Middletown, base 2.10c; Granite City, base 2.20c; Detroit del. 2.22c; Phila. del. 2.28c; New York del., 2.35c Pacific ports 2.65c.
(Andrews Steel Co. may quote hot-rolled sheets for shipment to Detroit and the Detroit area on the Middletown, O. base.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base, 3.05c; Granite City, base 3.15c; Detroit del. 3.17c; New York del. 3.41c; Phila. del. 3.39c; Pacific ports, 3.70c.

Galvanized Sheets, No. 24: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base 3.50c; Granite City, base 3.60c; New York del. 3.74c Phila del. 3.68c; Pacific ports 4.05c.
(Andrews Steel Co. may quote galvanized sheets 3.75c at established basing points.)

Corrugated Galv. Sheets: Pittsburgh, Chicago, Gary, Birmingham, 29 gage, per square 3.31c.

Culvert Sheets: Pittsburgh, Chicago, Gary, Birmingham, 16 gage, not corrugated, copper alloy 3.60c; copper iron 3.90c, pure iron 3.95c; zinc-coated, hot-dipped, heat-treated, No. 24, Pittsburgh 4.25c.

Enameling Sheets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, 10 gage,

base 2.75c; Granite City, base 2.85c; Pacific ports 3.40c.

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, 20 gage, base 3.35c; Granite City, base 3.45c; Pacific ports 4.00c.

Electrical Sheets, No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.20c	3.95c	3.30c
Armature	3.55c	4.30c	3.65c
Electrical	4.05c	4.80c	4.15c
Motor	4.95c	5.70c	5.05c
Dynamo	5.65c	6.40c	5.75c
Transformer			
72	6.15c	6.90c	.....
65	7.15c	7.90c	.....
58	7.65c	8.40c	.....
52	8.45c	9.20c	.....

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base, 1 ton and over, 12 inches wide and less 2.10c; Detroit del. 2.22c; Pacific ports 2.75c. (Joslyn Mfg. Co. may quote 2.30c, Chicago base.)

Cold Rolled Strip: Pittsburgh, Cleveland, Youngstown, 0.25 carbon and less 2.80c; Chicago, base 2.90c; Detroit, del. 2.92c; Worcester base 3.00c.

Commodity C. R. Strip: Pittsburgh, Cleveland, Youngstown, base 3 tons and over, 2.95c; Worcester base 3.35c.

Cold-Finished Spring Steel: Pittsburgh, Cleveland bases, add 20c for Worcester; .26-.50 Carb., 2.80c; .51-.75 Carb., 4.30c; .76-1.00 Carb., 6.15c; over 1.00 Carb., 8.35c.

Tin, Terne Plate

Tin Plate: Pittsburgh, Chicago, Gary, 100-lb. base box, $5.00; Granite City $5.10.

Tin Mill Black Plate: Pittsburgh, Chicago, Gary, base 29 gage and lighter, 3.05c; Granite City, 3.15c; Pacific ports, boxed 4.05c.

Long Ternes: Pittsburgh, Chicago, Gary, No. 24 unassorted 3.80c.

Manufacturing Ternes: (Special Coated) Pittsburgh, Chicago, Gary, 100-base box $4.30; Granite City $4.40.

Roofing Ternes: Pittsburgh base per package 112 sheets, 20 x 28 in., coating I.C., 8-lb. $12.00; 15-lb. $14.00; 20-lb. $15.00; 25-lb. $16.00; 30-lb. $17.25; 40-lb. $19.50.

Plates

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Sparrows Point, Coatesville, Claymont, 2.10c; New York, del., 2.30-2.55c; Phila., del., 2.15c; St. Louis, 2.34c; Boston, del., 2.42-67c; Pacific ports, 2.65c; Gulf Ports, 2.47c.

(Granite City Steel Co. may quote carbon plates 2.35c, f.o.b. mill. Central Iron & Steel Co. may quote plates at 2.20c, f.o.b. basing points.)

Floor Plates: Pittsburgh, Chicago, 3.35c; Gulf ports, 3.72c; Pacific ports, 4.00c.

Open-Hearth Alloy Plates: Pittsburgh, Chicago, Coatesville, 3.50c.

Wrought Iron Plates: Pittsburgh, 3.80c.

Shapes

Structural shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.10c; New York, del., 2.28c; Phila., del., 2.22c; Gulf ports, 2.47c; Pacific ports, 2.75c.

(Phoenix Iron Co., Phoenixville, Pa. may quote carbon steel shapes at 2.30c at established basing points and 2.50c, Phoenixville, for export.)

Steel Sheet Piling: Pittsburgh, Chicago, Buffalo, 2.40c.

Wire Products, Nails

Wire: Pittsburgh, Chicago, Cleveland, Birmingham (except spring wire) to manufacturers in carloads (add $2 for Worcester):

Bright basic, bessemer wire	2.60c
Galvanized wire	2.60c
Spring wire	3.20c
Wire Products to the Trade:	
Standard and cement-coated wire nails, polished and staples, 100-lb. keg	$2.55
Annealed fence wire, 100 lb.	3.05
Galvanized fence wire, 100 lb.	3.40
Woven fence, 12½ gage and lighter, per base column	67
Do., 11 gage and heavier	70
Barbed wire, 80-rod spool, col.	70
Twisted barbless wire, col.	70
Single loop bale ties, col.	59
Fence posts, carloads, col.	69
Cut nails, Pittsburgh, carloads	$3.55

Pipe, Tubes

Welded Pipe: Base price in carloads to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind. 2 points less on lap weld, 1 point less on butt weld. Pittsburgh base only on wrought iron pipe.

Butt Weld

In.	Steel Blk.	Steel Galv.	In.	Iron Blk.	Iron Galv.
⅛	56	33	⅛	24	3½
¼ & ⅜	59	40½	¾	30	10
½	63½	51	1-1¼	34	16
¾	66½	55	1½	38	18½
1-3	68½	57½	2	37½	18

Lap Weld

In.	Steel Blk.	Steel Galv.	In.	Iron Blk.	Iron Galv.
2	61	49½	1¼	23	3½
2½-3	64	52½	1½	28½	10
3½-6	66	54½	2	30½	12
7-8	65	52½	2¼, 3½	31½	14¼
9-10	64½	52	4	33½	18
11-12	63½	51	4½-8	32½	17
			9-12	28½	12

Boiler Tubes: Net base prices per 100 feet, f.o.b. Pittsburgh in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

O. D. Sizes	B.W.G.	—Seamless— Hot Rolled	Cold Drawn	—Lap Weld— Steel	Charcoal Iron
1"	13	$ 7.82	$ 9.01	.....	.....
1¼"	13	9.26	10.67	.....	.....
1½"	13	10.23	11.72	$ 9.72	$23.71
1¾"	13	11.64	13.42	11.06	22.93
2"	13	13.04	15.03	12.38	19.35
2¼"	13	14.54	16.76	13.79	21.63
2¼"	12	16.01	18.45	15.16	.....
2½"	12	17.54	20.21	16.56	26.57
2¾"	12	18.59	21.42	17.54	29.00
3"	12	19.50	22.48	18.35	31.38
3½"	11	24.63	28.37	23.15	39.81
4"	10	30.54	35.20	28.66	49.90
4½"	10	37.35	43.04	35.22	.....
5"	9	46.87	54.01	44.25	73.93
6"	7	71.96	82.93	68.14	.....

Rails, Supplies

Standard rails, over 60-lb., f.o.b. mill, gross ton, $40.00.

Light rails (billet), Pittsburgh, Chicago, Birmingham, gross ton, $40.00.

*Relaying rails, 35 lbs. and over, f.o.b. railroad and basing points, $28-$30.

Supplies: Angle bars, 2.70c; tie plates, 2.15c; track spikes, 3.00c; track bolts, 4.75c; do. heat treated, 5.00c.

*Fixed by OPA Schedule No. 46, Dec. 15, 1941.

Tool Steels

Tool Steels: Pittsburgh, Bethlehem, Syracuse, base, cents per lb.: Reg. carbon 14.00c; extra carbon 18.00c; special carbon 22.00c; oil-hardening 24.00c; high car.-chr. 43.00c.

High Speed Tool Steels:

Tung.	Chr.	Van.	Moly.	Pitts. base, per lb.
18.00	4	1	..	67.00c
18.00	4	2	1	77.00c
18.00	4	3	1	87.00c
1.5	4	1	8.5	54.00c
.....	4	2	8	54.00c
5.50	4	1.50	4	57.50c
5.50	4.50	4	4.50	70.00c

Stainless Steels

Base, Cents per lb.—f.o.b. Pittsburgh

CHROMIUM NICKEL STEEL

Type	Bars	Plates	Sheets	H. R. Strip	C. R. Strip
302	24.00c	27.00c	34.00c	21.50c	28.00c
303	26.00	29.00	36.00	27.00	33.00
304	25.00	29.00	36.00	23.50	30.00
308	29.00	34.00	41.00	28.50	35.00
309	36.00	40.00	47.00	37.00	47.00
310	49.00	52.00	53.00	48.75	56.00
311	49.00	52.00	53.00	48.75	56.00
312	36.00	40.00	49.00	.....	.....
*316	40.00	44.00	48.00	40.00	48.00
*317	50.00	54.00	58.00	50.00	58.00
†321	29.00	34.00	41.00	29.25	38.00
‡347	33.00	38.00	45.00	33.00	42.00
431	19.00	22.00	29.00	17.50	22.50

STRAIGHT CHROMIUM STEEL

403	21.50	24.50	29.50	21.25	27.00
**410	18.50	21.50	26.50	17.00	22.00
416	19.00	22.00	27.00	18.25	23.50
††420	24.00	28.50	33.50	23.75	36.50
430	19.00	22.00	29.00	17.50	22.50
‡‡430F	19.50	22.50	29.50	18.75	24.50
442	22.50	25.50	32.50	24.00	32.00
446	27.50	30.50	36.50	35.00	52.00
501	8.00	12.00	15.75	12.00	17.00
502	9.00	13.00	16.75	13.00	18.00

STAINLESS CLAD STEEL (20%)

304	.....	‡‡18.00	19.00	.....	.....

*With 2-3% moly. †With titanium. ‡With columbium. **Plus machining agent. ††High carbon. ‡‡Free machining. ‡‡Includes annealing and pickling.

Basing Point Prices are (1) those announced by U. S. Steel Corp. subsidiaries for first quarter of 1941 or in effect April 16, 1941 at designated basing points or (2) those prices announced or customarily quoted by other producers at the same designated points. Base prices under (2) cannot exceed those under (1) except to the extent prevailing in third quarter of 1940.

Extras mean additions or deductions from base prices in effect April 16, 1941.

Delivered prices applying to Detroit, Eastern Michigan, Gulf and Pacific Coast points are deemed basing points except in the case of the latter two areas when water transportation is not available, in which case nearest basing point price, plus all-rail freight may be charged.

Domestic Ceiling prices are the aggregate of (1) governing basing point price, (2) extras and (3) transportation charges to the point of delivery as customarily computed. **Governing basing point** is basing point nearest the consumer providing the lowest delivered price. **Emergency basing point** is the basing point at or near the place of production or origin of shipment.

Seconds or off-grade iron or steel products cannot be sold at delivered prices exceeding those applying to material of prime quality.

Export ceiling prices may be either the aggregate of (1) governing basing point or emergency basing point (2) export extras (3) export transportation charges provided they are the f.a.s. seaboard quotations of the U. S. Steel Export Co. on April 16, 1941. Domestic or export extras may be used in case of Lease-Lend tonnage.

Bolts, Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham Chicago. Discounts for carloads additional 5%, full containers, add 10%.

Carriage and Machine

⅛ x 6 and smaller	65½ off
Do., ¼ and ⅜ x 6-in. and shorter	63½ off
Do., ½ to 1 x 6-in. and shorter	61 off
1⅛ and larger, all lengths	59 off
All diameters, over 6-in. long	59 off
Tire bolts	50 off
Step bolts	56 off
Plow bolts	65 off

Stove Bolts

In packages with nuts separate 71-10 off; with nuts attached 71 off; bulk 80 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Nuts

Semifinished hex.	U.S.S.	S.A.E.
⅛-inch and less	62	64
⅛-1-inch	59	60
1⅛-1½-inch	57	58
1⅝ and larger	56	..

Hexagon Cap Screws

Upset 1-in., smaller	64 off
Milled 1-in., smaller	60 off

Square Head Set Screws

Upset, 1-in., smaller	71 off
Headless, ¼-in., larger	60 off
No. 10, smaller	70 off

Piling

Pittsburgh, Chicago, Buffalo	2.40c

Rivets, Washers

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham

Structural	3.75c
½-inch and under	65-5 off
Wrought washers, Pittsburgh, Chicago, Philadelphia, to jobbers and large nut, bolt manufacturers l.c.l.	$2.75-3.00 off

Metallurgical Coke

Price Per Net Ton

Beehive Ovens

Connellsville, furnace	*$6.00
Connellsville, foundry	7.00- 7.50
Connellsville prem. fdry.	7.25- 7.60
New River, foundry	8.00- 8.25
Wise county, foundry	7.50
Wise county, furnace	6.50
By-Product Foundry	
Kearny, N. J., ovens	12.15
Chicago, outside delivered	11.50
Chicago, delivered	12.25
Terre Haute, delivered	12.00
Milwaukee, ovens	12.25
New England, delivered	13.75
St. Louis, delivered	†12.25
Birmingham, ovens	8.50
Indianapolis, delivered	12.00
Cincinnati delivered	11.75
Cleveland, delivered	12.30
Buffalo, delivered	12.50
Detroit, delivered	12.25
Philadelphia, delivered	12.38

Operators of hand-drawn ovens using trucked coal may charge $6.50, effective Aug. 12, 1942.

† $12.75 from other than Ala., Mo., Tenn.

Coke By-Products

Spot, gal., freight allowed east of Omaha	
Pure and 90% benzol	15.00c
Toluol, two degree	28.00c
Solvent naphtha	27.00c
Industrial xylol	27.00c
Per lb. f.o.b. works	
Phenol (car lots, returnable drums)	12.50c
Do. less than car lots	13.25c
Do. tank cars	11.50c
Eastern Plants, per lb.	
Naphthalene flakes, balls, bbls. to jobbers	8.00c
Per ton, bulk, f.o.b. port	
Sulphate of ammonia	$29.20

Pig Iron

Prices (in gross tons) are maximums fixed by OPA Price Schedule No. 10, effective June 10, 1941. Exceptions indicated in footnotes. Allocation regulations from WPB Order M-17, expiring Dec. 31, 1942. Base prices bold face, delivered light face.

	No. 2 Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	**$25.00**	**$24.50**	**$26.00**	**$25.50**
Newark, N. J., del.	26.62	26.12	27.62	27.12
Brooklyn, N. Y., del.	27.65	.....	.....	28.15
Birdsboro, Pa., del.	**25.00**	**24.50**	**26.00**	**25.50**
Birmingham, base	†20.38	†19.00	.....	.....
Baltimore, del.	25.67	.....	.....	.....
Boston, del.	25.12	.....	.....	.....
Chicago, del.	‡24.47	.....	.....	.....
Cincinnati, del.	24.30	22.92	.....	.....
Cleveland, del.	24.12	23.24	.....	.....
Newark, N. J., del.	26.24	.....	.....	.....
Philadelphia, del.	25.51	25.01	.....	.....
St. Louis, del.	‡24.12	23.24	.....	.....
Buffalo, base	**24.00**	**23.00**	**25.00**	**24.50**
Boston, del.	25.50	25.00	26.50	26.00
Rochester, del.	25.53	.....	26.53	26.03
Syracuse, del.	26.08	.....	27.08	26.58
Chicago, base	**24.00**	**23.50**	**24.50**	**24.00**
Milwaukee, del.	25.17	24.67	25.67	25.17
Muskegon, Mich., del.	27.38	.....	.....	27.38
Cleveland, base	**24.00**	**23.50**	**24.50**	**24.00**
Akron, Canton, O., del.	25.47	24.97	25.97	25.47
Detroit, base	**24.00**	**23.50**	**24.50**	**24.00**
Saginaw, Mich., del.	26.45	25.95	26.95	26.45
Duluth, base	**24.50**	.....	**25.00**	**24.50**
St. Paul, del.	26.76	.....	27.26	26.76
Erie, Pa., base	**24.00**	**23.50**	**25.00**	**24.50**
Everett, Mass., base	**25.00**	**24.50**	**26.00**	**25.50**
Boston	25.50	25.00	26.50	26.00
Granite City, Ill., base	**24.00**	**23.50**	**24.50**	**24.00**
St. Louis, del.	24.50	24.00	.....	24.50
Hamilton, O., base	**24.00**	**23.50**	.....	**24.00**
Cincinnati, del.	24.68	24.68	.....	25.35
Neville Island, Pa., base	**24.00**	**23.50**	**24.50**	**24.00**
§Pittsburgh, del., No. & So. sides	24.69	24.19	25.19	24.69
Provo, Utah, base	**22.00**	.....	.....	.....
Sharpsville, Pa., base	**24.00**	**23.50**	**24.50**	**24.00**
Sparrows Point, Md., base	**25.00**	**24.50**	.....	.....
Baltimore, del.	26.05	.....	.....	.....
Steelton, Pa., base	.....	**24.50**	.....	**25.50**
Swedeland, Pa., base	**25.00**	**24.50**	**26.00**	**25.50**
Philadelphia, del.	25.80	25.30	.....	26.30
Toledo, O., base	**24.00**	**23.50**	**24.50**	**24.00**
Mansfield, O., del.	26.06	25.56	26.56	26.06
Youngstown, O., base	**24.00**	**23.50**	**24.50**	**24.00**

*Basic silicon grade (1.75-2.25%), add 50c for each 0.25%. †For phosphorus 0.70 and over deduct 38c. ‡Over 0.70 phos. §For McKees Rocks, Pa., add .55 to Neville Island base; Lawrenceville, Homestead, McKeesport, Ambridge, Monaca, Aliquippa, .84; Monessen, Monongahela City .97 (water); Oakmont, Verona 1.11; Brackenridge 1.24.

High Silicon, Silvery

6.00-6.50 per cent (base)	$29.50
6.51-7.00	$30.50
7.01-7.50	31.50
7.51-8.00	32.50
8.01-8.50	33.50
8.51-9.00	34.50
9.01- 9.50	$35.50
9.51-10.00	36.50
10.01-10.50	37.50
10.51-11.00	38.50
11.01-11.50	39.50

F.o.b. Jackson county, O., per gross ton, Buffalo base prices are $1.25 higher. Prices subject to additional charge of 50 cents a ton for each 0.50% manganese in excess of 1.00%.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton. (For higher silicon irons a differential over and above the price of base grades is charged as well as for the hard chilling irons, Nos. 5 and 6.)

Charcoal Pig Iron

Northern

Lake Superior Furn.	$28.00
Chicago, del.	31.54

Southern

Semi-cold blast, high phos., f.o.b. furnace, Lyles, Tenn.	$28.50
Semi-cold blast, low phos., f.o.b. furnace, Lyles, Tenn.	33.00

Gray Forge

Neville Island, Pa.	$23.50
Valley, base	23.50

Low Phosphorus

Basing points: Birdsboro and Steelton, Pa., and Buffalo, N. Y., $29.50 base; $30.61, delivered, Philadelphia.

Switching Charges: Basing point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differentials: Basing point prices are subject to an additional charge not to exceed 50 cents a ton for each 0.25 silicon in excess of base grade (1.75 to 2.25%).

Phosphorous Differential: Basing point prices are subject to a reduction of 38 cents a ton for phosphorous content of 0.70% and over.

Manganese Differentials: Basing point prices subject to an additional charge not to exceed 50 cents a ton for each 0.50% manganese content in excess of 1.0%.

Ceiling prices are the aggregate of (1) governing basing point (2) differentials (3) transportation charges from governing basing point to point of delivery as customarily computed. Governing basing point is the one resulting in the lowest delivered price for the consumer.

Exceptions to Ceiling Prices: Pittsburgh Coke & Iron Co. (Sharpsville, Pa. furnace only) and Struthers Iron & Steel Co. may charge 50 cents a ton in excess of basing point prices for No. 2 Foundry, Basic, Bessemer and Malleable. Mystic Iron Works, Everett, Mass., may exceed basing point prices by $1 per ton, effective April 20, 1942. Chester, Pa., furnace of Pittsburgh Coke & Iron Co. may exceed basing point prices by $2.25 per ton, effective July 27, 1942.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky.	$64.60

First Quality

Pa., Ill., Md., Mo., Ky.	51.30
Alabama, Georgia	51.30
New Jersey	56.00
Ohio	43.00

Second Quality

Pa., Ill., Md., Mo., Ky.	46.55
Alabama, Georgia	38.00
New Jersey	49.00
Ohio	36.00

Malleable Bung Brick

All bases	$59.85

Silica Brick

Pennsylvania	$51.30
Joliet, E. Chicago	58.90
Birmingham, Ala.	51.30

Ladle Brick

(Pa., O., W. Va., Md.)

Dry press	$31.00
Wire cut	29.00

Magnesite

Domestic dead-burned grains, net ton f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$54.00
Chem. bonded chrome	54.00
Magnesite brick	76.00
Chem. bonded magnesite	65.00

Fluorspar

Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail	$23.00-25.00
Do., barge	23.00-25.00
No. 2 lump	23.00-25.00

(OPA May 11 established maximum at Jan. 2, 1942, level.)

Ferroalloy Prices

Ferromanganese: 78-82%, carlots, gross ton, duty paid, Atlantic ports, $135; Del. Pittsburgh $140.65; f.o.b. Southern furnaces $135; Add $6 per gross ton for packed carloads $10 for ton, $13.50 for less-ton and $18 for less than 200-lb. lots, packed.

Spiegeleisen: 19-21%, carlots per gross ton, Palmerton, Pa. $36.

Electrolytic manganese: 99.9% plus, less ton lots, per lb. 42.00c. Ton lots 40.00c. Annual contracts 38.00c.

Chromium Metal: Per lb. contained chromium in gross ton lots, contract basis, freight allowed, 98% 80.00c, 96% 79.00c. Spot prices 5 cents per lb. higher.

Ferrocolumbium: 50-60%, per lb. contained columbium in gross ton lots, contract basis, f.o.b. Niagara Falls, N. Y. $2.25; less-ton lots $2.30. Spot prices 10 cents per lb. higher.

Ferrochrome: 66-70%; per lb. contained chromium in carloads, freight allowed, 4-6% carbon 13.00c; ton lots 13.75c; less-ton lots 14.00c; less than 200-lb. lots 14.25c. 66-72%, low carbon grades:

	Car loads	Ton lots	Less ton	Less 200 lbs.
2% C.	19.50c	20.25c	20.75c	21.00c
1% C.	20.50c	21.25c	21.75c	22.00c
0.20% C.	21.50c	22.25c	22.75c	23.00c
0.10% C.	22.50c	23.25c	23.75c	24.00c

Spot is ¼c higher

Chromium briquets: Contract basis in carloads per lb., freight allowed 8.25c; packed 8.50c; gross ton lots 8.75c; less-ton lots 9.00c; less 200-lb. lots 9.25c. Spot prices ¼-cent higher.

Ferromolybdenum: 55-75%, per lb. contained molybdenum, f.o.b. Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Calcium Molybdate (Molyte): 40-45%, per lb. contained molybdenum, contract basis, f.o.b. Langeloth and Washington, Pa., any quantity, 80.00c.

Molybdic Oxide Briquets: 48-52%, per lb. contained molybdenum, f.o.b. Langeloth, Pa., any quantity 80.00c.

Molybdenum Oxide: 53-63%, per lb. contained molybdenum in 5 and 20 lb. molybdenum contained cans, f.o.b. Langeloth and Washington, Pa., any quantity 80.00c.

Molybdenum Powder: 99% per lb. in 200-lb. kegs, f.o.b. York, Pa. $2.60; 100-200 lb. lots $2.75; under 100-lb. lots $3.00.

Ferrophosphorus: 17-19%, based on 18% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Rockdale, Tenn.; contract price $56.50, spot $62.25.

Ferrophosphorus: 23-26%, based on 24% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Mt. Pleasant, Tenn.; contract price $75, spot $80.

Ferrosilicon: Contract basis in gross tons per carload, bulk, freight allowed; unitage applies to each 1% silicon above or below base.

	Carloads	Ton lots
50%	$ 74.50	$ 87.00
Unitage	1.50	1.75
75%	135.00	151.00
Unitage	1.80	2.00
85%	170.00	188.00
Unitage	2.00	2.20
90-95%	10.25c	11.25c

Spot prices ¼-cent higher.

Silicon Metal: Contract basis per lb., f.o.b. producers' plants, freight allowed; 1% iron; carlots 14.50c, ton lots 15.00c, less-ton lots 15.25c, less 200 lbs. 15.50c.

Silicon Metal: Contract basis per lb.; 2% iron; carlots 13.00c, ton lots 13.50c, less-ton lots 13.75c, less 200 lbs. 14.00c. Spot prices ¼-cent higher.

Silicon Briquets: Contract basis; in carloads, bulk freight allowed, per ton $74.50; packed $80.50; ton lots $84.50; less-ton lots per lb. 4.00c; less 200-lb. lots per lb. 4.25c. Spot ¼-cent per lb. higher on less-ton lots; $5 per ton higher on ton lots and over.

Silicomanganese: Contract basis freight allowed. 1½% carbon: in carloads per gross ton $135; ton lots $147.50. Spot $5 per ton higher.

Silico-manganese Briquets: Contract basis in carloads per pound, bulk freight allowed 5.80c; packed 6.05c; ton lots 6.30c; less-ton lots 6.55c; less 200-lb. lots 6.80c. Spot prices ¼-cent higher.

Ferrotungsten: Carlots, per lb. contained tungsten, $1.90.

Tungsten Metal Powder: 98-99%, per lb. any quantity $2.55-2.65.

Ferrotitanium: 40-45%, f.o.b. Niagara Falls, N. Y., per lb. contained titanium: ton lots $1.23: less-ton lots $1.25. Spot 5 cents per lb higher.

Ferrotitanium: 20-25%, 0.10 maximum carbon; per lb. contained titanium; ton lots $1.35; less-ton lots $1.40. Spot 5 cents per lb. higher.

High-Carbon Ferrotitanium: 15-20%. Contract basis, per gross ton, f.o.b. Niagara Falls, N. Y., freight allowed to destinations east of Mississippi River and North of Baltimore and St. Louis, 6-8% carbon $142.50: 3-5% carbon $157.50.

Ferrovanadium: 35-40%, contract basis, per lb. contained vanadium, f.o.b. producer's plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Vanadium Pentoxide: Technical grade, 88-92 per cent V_2O_5; contracts, any quantity, $1.10 per pound V_2O_5 contained; spot 5 cents per pound higher.

Zirconium Alloys: 12-15%, contract basis, carloads bulk, per gross ton $102.50; packed $107.50; ton lots $108; less-ton lots $112.50. Spot $5 per ton higher.

Zirconium alloy: 35-40%, contract basis, carloads in bulk or package, per lb. of alloy 14.00c; gross ton lots 15.00c; less-ton lots 16.00c. Spot ¼-cent higher.

Alsifer: (Approx. 20% aluminum, 40% silicon, 40% iron) Contract basis, f.o.b. Niagara Falls, N. Y., per lb. 7.50c; ton lots 8.00c. Spot ¼-cent higher.

Simanal: (Approx. 20% each silicon, manganese, aluminum) Contract basis, freight allowed, per lb. of alloy: carlots 10.50c: ton lots 11.00c, less ton lots, 11.50c.

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials. As of April 16, 1942

	Soft Bars	Hot-rolled Strip Bands	Hot-rolled Strip Hoops	Plates ¼-in. & Over	Structural Shapes	Floor Plates	Sheets: Hot Rolled	Sheets: Cold Rolled	Sheets: Galv. No. 24	Cold Rolled Strip	Cold Drawn Bars: Carbon	Cold Drawn Bars: S.A.E. 2300	Cold Drawn Bars: S.A.E. 3100
Boston	3.98	4.06	5.06	3.85	3.85	5.66	3.71	4.68	5.11	3.46	4.13	8.88	7.23
New York (Met.)	3.84	3.96	3.96	3.76	3.75	5.56	3.58	4.60	5.00	3.51	4.09	8.84	7.19
Philadelphia	3.85	3.95	4.45	3.55	3.55	5.25	3.55	4.05	4.65	3.31	4.06	8.56	7.16
Baltimore	3.85	4.00	4.35	3.70	3.70	5.25	3.50	....	5.05	....	4.04	....	....
Norfolk, Va.	4.00	4.10	....	4.05	4.05	5.45	3.85	....	5.40	....	4.15	....	....
Buffalo	3.35	3.82	3.82	3.62	3.40	5.25	3.25	4.30	4.75	3.52	3.75	8.40	6.75
Pittsburgh	3.35	3.60	3.60	3.40	3.40	5.00	3.35	....	4.65	....	3.65	8.40	6.75
Cleveland	3.25	3.50	3.50	3.40	3.58	5.18	3.35	4.05	4.62	3.20	3.75	8.40	6.75
Detroit	3.43	3.43	3.68	3.60	3.65	5.27	3.43	4.30	4.84	3.40	3.80	8.70	7.05
Omaha	4.10	4.20	4.20	4.15	4.15	5.75	3.85	5.32	5.50	....	4.42	....	....
Cincinnati	3.60	3.67	3.67	3.65	3.68	5.28	3.42	4.37	4.92	3.48	4.00	8.75	7.10
Chicago	3.50	3.60	3.60	3.55	3.55	5.15	3.25	4.10	4.85	3.50	3.75	8.40	6.75
Twin Cities	3.75	3.85	3.85	3.80	3.80	5.40	3.50	4.35	5.00	3.83	4.34	9.09	7.44
Milwaukee	3.63	3.53	3.53	3.68	3.68	5.28	3.38	4.23	4.98	3.54	3.88	8.38	6.96
St. Louis	3.64	3.74	3.74	3.69	3.69	5.29	3.39	4.24	4.99	3.61	4.02	8.77	7.12
Indianapolis	3.60	3.75	3.75	3.70	3.70	5.30	3.45	....	5.01	....	3.97	....	....
Chattanooga*	3.80	4.00	4.00	3.85	3.85	5.80	3.75	....	4.50	....	4.39	....	....
Memphis	3.90	4.10	4.10	3.95	3.95	5.71	3.85	....	5.25	....	4.31	....	....
Birmingham	3.50	3.70	3.70	3.55	3.55	5.93	3.45	....	4.75	....	4.43	....	....
New Orleans	4.00	4.10	4.10	3.80	3.80	5.75	3.85	....	5.25	5.00	4.60	....	....
Houston, Tex.	3.75	4.30	4.30	4.05	4.05	5.50	4.00	....	5.25	....	6.90	....	....
Seattle	4.20	4.25	5.45	4.75	4.45	6.50	4.65	7.60	5.70	....	5.75	....	....
Los Angeles	4.35	4.90	6.70	4.90	4.60	7.15	4.95	7.15	5.95	....	6.60	10.55	9.55
San Francisco	3.95	4.50	6.25	4.65	4.35	6.35	4.55	6.40	6.10	....	6.80	10.80	9.80

*Not named in OPA price order.

	S.A.E. Hot-rolled Bars (Unannealed): 1035-1050	2300 Series	3100 Series	4100 Series	6100 Series
Boston	4.28	7.75	6.05	5.80	7.90
New York (Met.)	4.04	7.60	5.90	5.65	....
Philadelphia	4.10	7.56	5.86	5.61	8.56
Baltimore	4.45	....	....	....	....
Norfolk, Va.	....	....	....	....	....
Buffalo	3.55	7.35	5.65	5.40	7.50
Pittsburgh	3.40	7.45	5.75	5.50	7.60
Cleveland	3.30	7.55	5.85	5.85	7.70
Detroit	3.48	7.67	5.97	5.72	7.19
Cincinnati	3.65	7.69	5.99	5.74	7.84
Chicago	3.70	7.35	5.65	5.40	7.50
Twin Cities	3.95	7.70	6.00	6.09	8.19
Milwaukee	3.83	7.33	5.88	5.63	7.73
St. Louis	3.84	7.72	6.02	5.77	7.87
Seattle	6.25	....	8.00	7.85	8.65
Los Angeles	4.80	9.55	8.55	8.40	8.80
San Francisco	5.45	9.80	8.80	8.65	9.05

BASE QUANTITIES

Soft Bars, Bands, Hoops, Plates, Shapes, Floor Plates, Hot Rolled Sheets and SAE 1035-1050 Bars: Base, 400-1999 pounds; 300-1999 pounds in Los Angeles; 400-39,999 (hoops, 0-299) in San Francisco; 300-4999 pounds in Portland; 300-9999 Seattle; 400-14,999 pounds in Twin Cities; 400-3999 pounds in B'ham., Memphis.

Cold Rolled Sheets: Base, 400-1499 pounds in Chicago, Cincinnati, Cleveland, Detroit, New York, Omaha, Kansas City, St. Louis; 450-3749 in Boston; 500-1499 in Buffalo; 1000-1999 in Philadelphia, Baltimore; 750-4999 in San Francisco; 300-4999 in Portland, Seattle; any quantity in Twin Cities, New Orleans; 300-1999 Los Angeles.

Galvanized Sheets: Base, 150-1499 pounds, New York; 150-1499 in Cleveland, Pittsburgh, Baltimore, Norfolk; 150-1049 in Los Angeles; 300-10,000 in Portland, Seattle; 450-3749 in Boston; 500-1499 in Birmingham, Buffalo, Chicago, Cincinnati, Detroit, Indianapolis, Milwaukee, Omaha, St. Louis, Tulsa; 3500 and over in Chattanooga; any quantity in Twin Cities; 750-1500 in Kansas City; 150 and over in Memphis; 25 to 49 bundles in Philadelphia; 750-4999 in San Francisco.

Cold Rolled Strip: No base quantity; extras apply on lots of all size.

Cold Finished Bars: Base, 1500 pounds and over on carbon, except 0-299 in San Francisco, 500-999, Los Angeles, 1000 and over in Portland, Seattle; 1000 pounds and over on alloy, except 0-4999 in San Francisco.

SAE Hot Rolled Alloy Bars: Base, 1000 pounds and over, except 0-4999, San Francisco; 0-1999, Portland, Seattle.

EUROPEAN IRON, STEEL PRICES

Dollars at $4.02⅛ per Pound Sterling

Export Prices f.o.b. Port of Dispatch—

By Cable or Radio

	BRITISH Gross Tons f.o.b. U.K. Ports	L	s	d
Merchant bars, 3-inch and over	$66.50	16	10	0
Merchant bars, small, under 3-inch, re-rolled	3.60c	20	0	0
Structural shapes	2.95c	15	10	0
Ship plates	2.90c	16	2	6
Boiler plates	3.17c	17	12	6
Sheets, black, 24 gage	4.00c	22	5	0
Sheets, galvanized, corrugated, 24 gage	4.61c	25	12	6
Tin plate, base box, 20 x 14, 108 pounds	$ 6.20	1	10	9

British ferromanganese $120.00 delivered Atlantic seaboard duty-paid.

Domestic Prices Delivered at Works or Furnace—

	L	s	d
Foundry No. 3 Pig Iron, Silicon 2.50-3.00 $25.79	6	8	0 (a)
Basic pig iron 24.28	6	0	6 (a)
Furnace coke, f.o.t. ovens 8.87	2	4	0
Billets, basic soft, 100-ton lots and over 49.37	12	5	9
Standard rails, 60 lbs. per yard, 500-ton lots & over 2.61c	14	10	6
Merchant bars, rounds and squares, under 3-inch 3.17c	17	12	0††
Shapes 2.77c	15	8	0††
Ship plates 2.91c	16	3	0††
Boiler plates 3.06c	17	0	6††
Sheets, black, 24 gage, 4-ton lots and over 4.10c	22	15	0
Sheets, galvanized 24 gage, corrugated, 4-ton lots & over 4.70c	26	2	
Plain wire, mild drawn, catch weight coils, 2-ton lots and over 4.28c	23	15	0
Bands and strips, hot-rolled 3.30c	18	7	0

(a) del. Middlesbrough. 5s rebate to approved customers. ††Rebate 15s on certain conditions.

Ores

Lake Superior Iron Ore

Gross ton, 51½% Lower Lake Ports

Old range bessemer	$4.75
Mesabi bessemer	4.45
High phosphorus	4.35
Mesabi bessemer	4.60
Old range nonbessemer	4.60

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 55-63%, contract	13.00

Foreign Ore

Cents per unit, c.i.f. Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mang.	Nom.
N. African low phos.	Nom.
Spanish, No. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% f.o.b. Rio de Janeiro	7.50-8.00c

Tungsten Ore

Chinese wolframite, per short ton unit, duty paid	$24.00

Chrome Ore

Gross ton c.i.f. Baltimore; dry basis; subject to penalties for guarantees

Indian and African, 2.8:1 lump, 48%	$39.00
South African (excluding war risk)	
No ratio lump, 44%	28.00
Do. 45%	29.00
Do. 48%	34.00
Do. concentrates, 48%	33.00
Do. 50%	34.00
Brazilian (nominal)	
2.5:1 lump, 44%	28.50
3:1 lump, 48%	38.00

Manganese Ore

(Nominal)

Including war risk but not duty, cents per unit cargo lots

Caucasian, 50-52%	....
S. African, 48%	80.00-86.00
Indian, 50%	80.00-86.00
Brazilian, 46%	78.00-84.00
Cuban, 51%, duty free	85.00
Domestic, 48%, f.o.b. mines	$1.00

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$0.75

MAXIMUM PRICES FIXED BY OPA ON IRON AND STEEL SCRAP

Other than railroad grades quoted on the basis of basing point prices from which shipping point prices and consumers' delivered prices are to be computed. Scrap originating from railroads quoted delivered to consumers' plants located on the line of the railroad from which the material originated. All prices in gross tons. A basing point includes its switching district.

PRICES FOR OTHER THAN RAILROAD SCRAP

				ELECTRIC FURNACE AND FOUNDRY GRADES										
				Low Phos. Grades Bar		Heavy Structural, Plate			Cut Auto Scrap			Alloy-Free Low Phos. & Sulphur Turnings	First Cut Heavy Axle & Forge Turnings	Electric Furnace Bundles
	OPEN HEARTH GRADES*	Machine Shop Turnings	BLAST FURNACE GRADES*	Billet, Bloom Forge Crops	Crops and smaller; Punchings, Plate	3 ft. and less	2 ft. and less	1 ft. and less	3 ft. and less	2 ft. and less	1 ft. and less			
Pittsburgh, Brackenridge, Butler, Johnstown, Midland, Monessen, Sharon, Steubenville, Weirton, Canton, Youngstown, Warren	$20.00	$16.00	$16.00	$25.00	$22.50	$21.00	$21.50	$22.00	$20.00	$20.50	$21.00	$18.00	$19.50	$21.00
Claymont, Coatesville, Harrisburg, Conshohocken, Phoenixville	18.75	14.75	14.75	23.75	21.25	19.75	20.25	20.75	18.75	19.25	19.75	16.75	18.25	19.75
Bethlehem	18.25	14.25	14.25	23.25	20.75	19.25	19.75	20.25	18.25	18.75	19.25	16.25	17.75	19.25
Buffalo	19.25	15.25	15.25	24.25	21.75	20.25	20.75	21.25	19.25	19.75	20.25	17.25	18.75	20.25
Cleveland, Middletown, Cincinnati, Portsmouth, Ashland	19.50	15.50	15.50	24.50	22.00	20.50	21.00	21.50	19.50	20.00	20.50	17.50	19.00	20.50
Detroit	17.85	13.85	13.85	22.85	20.35	18.85	19.35	19.85	17.85	18.35	18.85	15.85	17.35	18.85
Toledo		13.85	13.85											
Chicago	18.75	14.75	14.75	23.75	21.25	19.75	20.25	20.75	18.75	19.25	19.75	16.75	18.25	19.75
Kokomo	18.25	14.25	14.25	23.25	20.75	19.25	19.75	20.25	18.25	18.75	19.25	16.25	17.75	19.25
Duluth	18.00	14.00	14.00	23.00	20.50	19.00	19.50	20.00	18.00	18.50	19.00	16.00	17.50	19.00
St. Louis	17.50	13.50	13.50	22.50	20.00	18.50	19.00	19.50	17.50	18.00	18.50	15.50	17.00	18.50
Birmingham, Atlanta, Alabama City, Los Angeles, San Francisco, Pittsburg, Calif.	17.00	13.00	13.00	22.00	19.50	18.00	18.50	19.00	17.00	17.50	18.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	12.50	12.50	21.50	19.00	17.50	18.00	18.50	16.50	17.00	17.50	14.50	16.00	17.50
Seattle	14.50	10.50	10.50	19.50	17.00	15.50	16.00	16.50	14.50	15.00	15.50	12.50	14.00	15.50

RAILROAD SCRAP

	Heavy Melting Steel	Scrap Rails	Rails for Rolling	Scrap Rails 3 ft. and under	Scrap Rails 2 ft. and under	Scrap Rails 18 in. and under
Pittsburgh, Wheeling, Steubenville, Sharon, Youngstown, Canton	21.00	22.00	23.50	24.00	24.25	24.50
Philadelphia, Wilmington, Sparrows Point	19.75	20.75	22.25	22.75	23.00	23.25
Cleveland, Cincinnati, Middletown, Ashland, Portsmouth	20.50	21.50	23.00	23.50	23.75	24.00
Chicago	19.75	20.75	22.25	22.75	23.00	23.25
Buffalo	20.25	21.25	22.75	23.25	23.50	23.75
Detroit	18.85	19.85	21.35	21.85	22.10	22.35
Kokomo	19.25	20.25	21.75	22.25	22.50	22.75
Duluth	19.00	20.00	21.50	22.00	22.25	22.50
Kansas City, Mo.	17.00	18.00	19.50	20.00	20.25	20.50
St. Louis	18.50	19.50	21.00	21.50	21.75	22.00
Birmingham	18.00	19.00	20.50	21.00	21.25	21.50
Los Angeles, San Francisco	18.00	19.00	20.50	21.00	21.25	21.50
Seattle	15.50	16.50	18.00	18.50	18.75	19.00

CAST IRON SCRAP OTHER THAN RAILROAD

(Shipping point prices in gross tons)

	Group A	Group B	Group C
No. 1 Cupola Cast	$18.00	$19.00	$20.00
No. 1 Machinery Cast, Drop Broken, 150 lbs. & Under	18.00	19.00	20.00
Clean Auto Cast	18.00	19.00	20.00
Stove Plate	17.00	18.00	19.00
Unstripped Motor Blocks	17.50	18.50	19.50
Heavy Breakable Cast	15.50	16.50	17.50
Charging Box Size Cast	17.00	18.00	19.00
Miscellaneous Malleable	20.00	21.00	22.00

Group A includes the states of Montana, Idaho, Wyoming, Nevada, Utah, Arizona and New Mexico.

Group B includes the states of North Dakota, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, Texas and Florida.

Group C includes states not named in groups A and B, plus Kansas City, Kans.-Mo.

*Open Hearth Grades refer to No. 1 heavy melting steel, No. 1 hydraulic compressed black sheet scrap, No. 2 heavy melting steel, dealers' No. 1 bundles, dealers' No. 2 bundles and No. 1 busheling. No. 1 chem. borings, 1 per cent oil, $1 under, No. 2, 1.5 per cent oil, $2 under heavy melting steel. No. 3 bundles, $2 under No. 1 heavy melting; cast steel, $2.50 over, tube scrap $3 over, auto springs, crankshafts, $1 over No. 1 heavy melting. Blast Furnace Grades refer to mixed borings and turnings, shovelins turnings, No. 2 busheling and cast iron borings.

A basing point includes the switching district of the city named. The Pittsburgh basing point includes the switching districts of Bessemer, Homestead, Duquesne, Munhall and McKeesport, Pa. Cincinnati basing point includes the switching district of Newport, Ky. St. Louis basing point includes the switching districts of Granite City, East St. Louis and Madison, Ill. San Francisco basing point includes the switching districts of South San Francisco, Niles and Oakland, Calif.

Inferior Grades: Maximum prices of inferior grades shall continue to bear the same differential below the corresponding listed grades as existed from Sept. 1, 1940, to Jan. 31, 1941. No premium allowed on grades considered superior, unless approved by OPA. Addition of special preparation charges prohibited. Purchase of electric furnace or foundry grades for open hearth or blast furnace use permitted only at no more than price for corresponding open hearth grade. Exceptions: Low phos. billet, bloom and forge crops and electric furnace bundles may exceed open hearth price, and electric furnace bundles may exceed blast furnace price, if material is delivered to the consumer direct from the original industrial producer.

Commissions: No commission is payable except by a consumer to a broker for services rendered. The commission not to exceed 50 cents per gross ton. No commission is payable unless: The broker guarantees the quality and delivery of an agreed tonnage the scrap is purchased at a price no higher than the maximum allowed; the broker sells the scrap to the consumer at the same price at which he purchased it; the broker does not split the commission with the seller of the scrap, with another broker or sub-broker, or with the consumer. Commissions must be shown as separate item on invoice.

Maximum Shipping Point Price: Where shipment to consumer is by rail, vessel or combination of both, scrap is at its shipping point when it has been placed f.o.b. railroad car or f.a.s. vessel. In such cases, maximum shipping point prices are: (1) For shipping points located within a basing point, the price listed in the above table for scrap at the basing point in which the shipping point is located, minus the lowest established switching charge for scrap within the basing point; and (2) for shipping points located outside a basing point, the price in the above table for scrap at the most favorable basing point, minus the lowest transportation charge by rail, water or combination thereof. When vessel movement is involved, dock charges shall be 50 cents at Memphis, $1 at Great Lakes ports, $1.25 at New England ports, 75 cents elsewhere. New England shipping point prices computed on most favorable basing point prices; maximum transportation charge on scrap from New England, $6.65 per ton.

Scrap shipped by motor vehicle is at its shipping point when loaded. For shipping points within basing points, maximum is price listed in table minus lowest switching charge. When outside basing point, maximum is price at most favorable basing point minus lowest established charge when hauled by common carrier. When hauled by seller charges are based on carload rate for rail shipment, minimum $1.00 per ton.

Maximum Delivered Prices: Determined by adding established transportation charges to shipping point price, not to exceed by more than $1 (plus freight rate increase March 18, 1942) the prices listed in the table for the nearest basing point. Certain exceptions specified in Revised Price Schedule No. 4 (Amendment 1) apply to St. Louis district consumers, to WPB allocations, to water shipments from Duluth or Superior, Wis., to shipments of billets, blooms and forge crops from Pittsburgh and to shipments of electric and foundry grades from Michigan; to shipments of turnings to ferroalloy producers and of borings to chemical users. Delivered prices of scrap shipped under WPB allocations may exceed prices at nearest basing point by more than $1, if most economical transportation is used.

Unprepared Scrap: Above prices are for prepared scrap. Maximum prices for unprepared scrap are $2.50 less (railroad grades $3.50 less; material from which Nos. 1, 2 and 3 bundles made is $4 less) than for the corresponding grades of prepared scrap, except for heavy breakable cast. In no case shall electric furnace and foundry grades be used as the "corresponding grades of prepared scrap." Graveyard autos not considered unprepared scrap.

Remote Scrap: Consists of all grades, except railroad scrap, in Florida, Montana, Idaho, Wyoming, Nevada, Arizona, New Mexico, Texas, Oklahoma, Oregon, Washington, Louisiana, Utah. Delivered price may exceed by not more than $5 the price at the basing point nearest consumer's plant, provided sworn details furnished OPA. Permission required to exceed by more than $5 the nearest basing point price. Colorado scrap is remote scrap for Colorado consumers only.

Sheets, Strip . . .

Sheet & Strip Prices, Page 298

Volume of sheet orders accepted by most producers is limited by allocations of semifinished steel under the mill quota system. Some are practically confined to allocations on most finishes and others require highest ratings to make delivery promise possible.

Inquiry includes substantial requirements for bombs. One contract for an incendiary to be assembled in New England will be subcontracted widely. In seeking to fill small-lot requirements buyers are hampered by low, unbalanced warehouse stocks, jobbers not receiving sheet quotas in most instances. Galvanized sheets are especially tight. Under certain conditions distributors may apply for black sheets under the galvanized quotas and charge sales against the same, but few are doing so.

Few, if any, sheet mills can promise even tentative deliveries on hot and cold sheets carrying ratings under AA-2 and few can offer shipments on these high ratings before mid-December, reflecting a further extension. This is attributed in part to substantial direct allocations by Washington and to still further re-ratings of old tonnage, although not to the extent of a few weeks ago. Another important factor is the mill quota system, which sets up definite maximums in the various grades. In some cases, however, these quotas have actually eased the delivery situation. This is true in certain specialties, such as electrical sheets.

Meanwhile there is considerable speculation over a new set up which is expected to be announced by Washington within a few days, and which, it is said, may eliminate the production requirements plan and the allocation classification system.

Plates . . .

Plate Prices, Page 299

Plate requirements of larger fabricators are being filled more smoothly and with less delinquent tonnage at the end of each month. Some delay continues in sheared and heavier material, but this is lessening each month. Difficulty continues in obtaining small lots to fill in. Warehouses are receiving little definitely specified tonnage and deliveries are mainly over-runs and narrow widths from continuous strip mills.

As additional miscellaneous war contracts are taken by plate fabricating shops the trend toward use of heavier plates increases. Dearth of orders for small tanks in many shops is indicated by the fact that 52 tankmakers quoted on a lot of 100 units of 515 gallons capacity for the Civil Aeronautics Administration. This inquiry had been increased from 62 to 100 and a second opening for 78 fuel tanks followed.

Bars . . .

Bar Prices, Page 298

Increased stringency in steel bar deliveries is indicated by the fact that many producers now have nothing to offer on ratings below AA-2. Less than a fortnight ago some mills could do much better on medium sizes. Under the mill quota system in effect the past two months some current tonnages are being rolled at lower ratings but producers see no opportunity of making definite delivery promises on new orders at such ratings.

By far the greater portion of orders now are quoted tentatively for December and beyond. In the case of flats and large rounds deliveries fall largely into first quarter, even on ratings of AA-1 and AA-2.

Pipe . . .

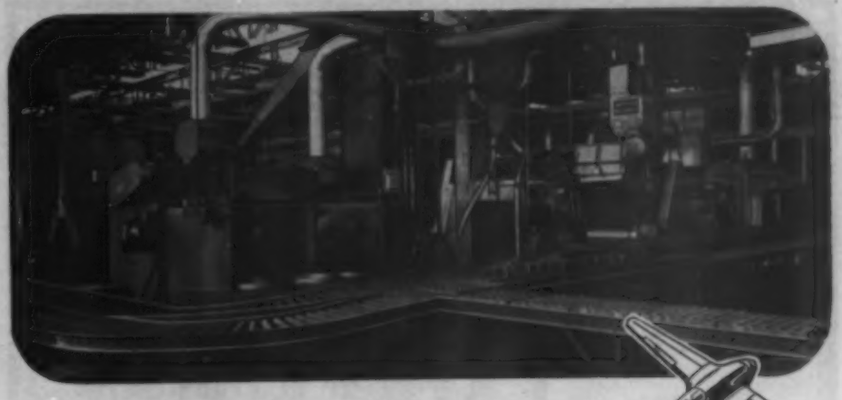
Pipe Prices, Page 299

Pipe distributors in many cases compete keenly for business with high ratings on which they can extend priorities for replacements, including larger lots for direct mill shipment. Some suppliers seem more anxious to obtain the high rating than the tonnage involved and some shading results.

On an f.o.b. basis for several hundred tons of black and galvanized pipe for Panama deliveries ranged from seven to 42 days by a Pittsburgh maker others naming much longer period up to 125 days.

Inventories of small diameters are lower and unbalanced. Butt-weld sales are numerically greater than lap-weld, but the latter are in heavier tonnage, mainly direct purchases on government procurements. Last contracts against the large Navy inquiry of several weeks past have been placed.

Inquiries for steel tubing sometimes



WINGS
to keep your cleaning production FLYING

CLEANING production is soaring these days because of the extensive use of airless WHEELABRATOR speed-cleaning.

Faster production with less equipment, less power, less space, less cost is the invaluable contribution the WHEELABRATOR is making toward Victory.

Read some of the performance reports shown below.

THE WHEELABRATOR SETS A FAST PACE

CHICAGO, ILL.: A 48" x 72" WHEELABRATOR Tumblast requires only 8 minutes to remove annealing scale and 4 to 5 minutes to rough clean loads weighing from 1,000 to 2,000 lbs. in this large jobbing foundry.

CLEVELAND, OHIO: The installation of a 6' Plain WHEELABRATOR Tablast enabled this large jobbing foundry to reorganize its cleaning department and speed-up shipment of castings to war production customers.

SPARTANSBURG, S. C.: Approximately 22 tons of gray iron castings are cleaned in less than five hours in a 48" x 42" WHEELABRATOR Tumblast at this large textile machinery company.

ROCHESTER, N. Y.: By installing a special two-wheel WHEELABRATOR Cabinet, this railroad parts manufacturer was able to clean reservoir castings, much faster, more thoroughly, and at a 50% saving in cost.

MILWAUKEE, WISC.: This large manufacturing company cleans 2,000 pound loads of malleable pipe fittings in ten minutes in a 48" x 42" WHEELABRATOR Tumblast.

TOLEDO, OHIO: This large jobbing foundry cleans forty to fifty tons of green and annealed steel castings in fifteen hours on a special WHEELABRATOR Tablast.

THE AIRLESS WHEELABRATOR BRINGS YOU THESE ADVANTAGES

1. High-speed cleaning
2. Low cleaning cost
3. Reduces horsepower
4. Conserves space
5. Reduces breakage
6. Speeds up machining and grinding
7. Lengthens tool life
8. Simplifies inspection
9. Improves appearance
10. Provides perfect bond for final finishing
11. Insures accurate hardness tests

AMERICAN FOUNDRY EQUIPMENT CO.
Blast Cleaning and Dust Control Engineers
509 SOUTH BYRKIT STREET • MISHAWAKA, INDIANA

attract no bidders, as was the case for Boston last month and few producers quote on boiler tubes. No definite deliveries were promised on tubes destined for export to Panama, but in one case 168 to 196 days, f.o.b. Beaver Falls, Pa., was quoted.

Office of Production Management has established dollars and cents prices for reusable steel and iron pipe, cutting ceiling quotations back to the levels of Oct. 1-15, 1941. The order is effective Oct. 3 and is contained in maximum price regulation 230. Prices for reusable pipe other than oil country tubular goods in terms of percentages of jobbers' resale prices on new pipe are 70 per cent of the list prices of the lowest grade of new pipe having the same diameter and weight per foot. Prices of reusable oil country tubular goods are 75 per cent. Premiums are provided to encourage segregation and thorough reconditioning of top-grade reusable material.

Structural Shapes...

Structural Shape Prices, Page 299

Use of structural steel for projects now active is being cut to a minimum, numerous structures being redesigned for concrete and timber. An inquiry originally calling for 2800 tons of fabricated shapes has been revised to require only 1200 tons of steel. A substantial part of plants and equipment for production of synthetic rubber is yet to be built and will require steel for tanks, vats, pipes and valves.

Plain material is scarce and considerable tonnage is bypassing structural fabricating shops through allocations to shipyards. Though priorities are somewhat weakened by increased allocations, AA-3 or better is generally required for plain material for reasonably prompt rolling and delivery.

New business booked by the structural steel fabricating industry in August was 73,541 net tons, according to the American Institute of Steel Construction, New York. This compares with 113,508 tons in July and 158,658 tons in August, 1941. Shipments in August were 165,212 tons, compared with 182,626 tons in July. During eight months the industry shipped 1,425,518 tons and has a backlog scheduled for fabrication within four months of 783,561 tons.

Reinforcing Bars...

Reinforcing Bar Prices, Page 299

Reinforcing materials have experienced a moderate uplift in demand in the last few days, and further work appears to be in the making. Tonnages range from 100 to 500 tons, and seem insignificant in comparison with the 1000 to 5000-ton projects of a few months back. Nevertheless, under present steel supply conditions the smaller tonnages magnify in importance. Most current construction is in connection with army and navy facilities and essential war plant expansions.

Pig Iron...

Pig Iron Prices, Page 300

While some pig iron consumers with ratings below A-1-k believe they have not been allocated all the tonnage for October they should receive, others in the lower categories appear satisfied. Some important war work is included in the lower ratings and most of these needs were filled. A current easing in the scrap situation has relieved some foundries of necessity for as much pig iron as they believed they would consume in October.

Youngstown Sheet & Tube Co. blew in its rebuilt "D" blast furnace at its Campbell plant, Youngstown O., Sept. 26. In rebuilding the capacity was increased from 750 to 1050 tons per day. The stack was out only 83 days. Carnegie-Illinois Steel Corp. last week blew out its No. 4 stack at the Ohio works, Youngstown, for relining.

Scrap...

Scrap Prices, Page 302

Encouraging reports are being received by War Production Board on progress in the concentrated drive for scrap now well under way. Most reliance is being placed on results expected from operations of War Materials Inc., recently organized to subsidize scrap reclamation from projects which could not be handled in normal channels because of cost or other difficulties.

Though the situation is much better it is not yet certain that sufficient material can be gathered before cold weather to carry through the winter. Some steelmakers have been able to accumulate small reserves, though in most cases these are far below normal stocks for

★ ONE OF THE LARGEST, BEST EQUIPPED GALVANIZING PLANTS IN THE U. S.

planned and manned to handle

LARGE TONNAGES!

AT ENTERPRISE. . . Thoroughly experienced, skilled workmen, in a newly enlarged and completely equipped plant, work under the direction of responsible ownership - management. Large size kettles, adequate handling facilities and storage space, enable us to fill war orders of any size —promptly — efficiently — to highest quality standards.

ENTERPRISE GALVANIZING COMPANY

2525 E. CUMBERLAND ST. PHILADELPHIA, PA.

"To Economize—Galvanize at Enterprise!"

THIS IS WHERE YEHUDI LIVES—It's the thermostatic control on our oil-fired kettles . . . and it maintains constant temperature in the all-important zinc bath. It's just one of the aids to human skill that speed our work and insure its uniform quality. It's one reason why Enterprise Galvanizing can be depended upon to meet most exacting specifications.

winter. In the Buffalo district about 180,000 tons is said to be in stock, sufficient for about two months at the present rate of consumption. Stocks of at least 300,000 tons are considered essential for winter.

Full effect of current collections will not be felt for some time, as much time is required to prepare for shipment to mills. Labor shortage enters this picture, most yards being short of help. Railroads are supplying more tonnage than has been the case for several months, a large yard operator at St. Louis receiving 50 per cent more in September than in prior months. In some areas better success is being achieved in the drive for tin cans, the public apparently being more interested in this angle. Increased activity is noted in removal of street railway tracks, one such project involving 13 miles of rails at Detroit, estimated to yield 2400 tons of steel. Much of this will be earmarked for repairs and extensions instead of being cut up for melting.

In the Chicago area the situation has improved over that of a month ago but receipts are not sufficient yet to build reserves and supply is irregular.

Iron Ore . . .

Iron Ore Prices, Page 301

The two billionth ton of Lake Superior iron ore was loaded into one of the Great Lakes ore carriers in September, tonnage for the district reaching that mark about Sept. 7 while for American producers it was attained about Sept. 18. From the beginning of records in 1854 it required 66 years to produce the first billion tons, this being reached in 1920. The second billion was shipped in almost exactly one-third this period, slightly less than 22 years.

Production by ranges to the end of 1941 was as follows:

Range	Year Opened	Gross Tons
Marquette	1854	213,192,835
Menominee	1877	193,379,070
Gogebic	1877	227,858,430
Vermilion	1884	70,510,057
Mesabi	1892	1,180,266,219
Mayville	1892	2,379,865
Baraboo	1894	643,033
Cuyuna	1911	43,924,454
Canadian Mines	1904	5,935,450
New Helen Mine (C)	1939	935,448
		1,937,024,868

The 640-foot Irving S. Olds fifth of the large ore carriers built for the Pittsburgh Steamship Co., is ready for commissioning and will load its first cargo within a short time.

Tin Plate . . .

Tin Plate Prices, Page 299

Electrolytic tin plate will provide a major part of the limited production during first half, the quantity depending on success of operating the new lines. At least one of the new installations has started production and others will be ready before the end of the year, the remainder starting during first half. Base price has been unofficially set at $4.50 per base box, 50 cents below the hot-dipped base. Current production is lower than planned as supply of black plate has been below expectations, as mills have concentrated on heavier products. October sheet quotas promise to be somewhat larger. The increase may be enough to allow tin mills to increase production sufficiently to attain 50 per cent of capacity for last half.

Black plate rejects are subject to the quota restrictions of M-104, War Production Board has announced, in amending the order. Quota restrictions are set up for tin plate, terne and black plate. Allocations to crown manufacturers of black plate rejects already have been made but the order emphasizes that the allocation is subject to quota restrictions contained in M-104.

Some leading tin plate producers doubt if 25 per cent of their facilities will be engaged over the remainder of the year. Close of the major canning season, substantial inventories of containers in some quarters, and various limitations on the use of tin plate have combined to make the outlook for these producers over the next few months exceedingly drab. The outlook in terne plate also is said to be only a little better.

Ferroalloys . . .

Ferroalloy Prices, Page 300

Despite substantial expansion in ferroalloy capacity, demand more than keeps pace in practically all products. In ferromanganese, where the situation is somewhat flexible by virtue of the fact that various furnaces exist which can be taken

The illustration shows a Ransohoff continuous process pickling machine for handling cartridge cases after annealing.

THE PARTS IN THAT
"PACKAGED HELL FOR HITLER"
MUST BE GOOD AND CLEAN

RANSOHOFF
Metal Cleaning
EQUIPMENT

Let Ransohoff Engineers show you how to make short work of your cleaning problems.

IS READY TO DO ITS SHARE IN YOUR PLANT, QUICKLY AND EFFICIENTLY

Ransohoff also builds machines for use before annealing as well as for bonderiting finished cases . . . and for cleaning small size cartridge cases prior to Parkerizing.

IDEAL
N. RANSOHOFF, Inc.
Cleaning Machinery Specialists

TOWNSHIP AND BIG FOUR R. R.
CINCINNATI, O.

Even Inexperienced Help Marks Materials So Markings STAY PUT!

Exit the cumbersome paint-brush-and-bucket of marking wartime materials! Also the costly method of marking these precious wartime materials with marks that rub off or fade!

Enter the new era of marking materials with *paint in stick form*. Handy as a pencil to carry and use. Speed is what you get with Paintcil. Speed-and accuracy—and permanence! Sun, rain, slashing sleet can't harm it. Doesn't drip or fade. Marks are removed only when you want to remove them!

Marks are made as quickly as you can write. Even the newest "greenhorn"—of either sex—can use Paintcil expertly at once.

Proven over 5 years practical use. Now used by literally hundreds of war plants. Can be used on any hard surface material such as glass, metal, wood, etc. Distinctive types for marking *hot* metal, too!

Write or wire for actual samples. Specify color desired.

PAINTCIL

HELMER-STALEY, INC. Chicago, Illinois
111 W. Huron St.

off pig iron to cope with any prospective squeeze in this alloy, a good balance between output and demand can be maintained, and in recognition of this fact there has been no allocation in ferromanganese, nor is any indicated. In certain other alloys the situation is more stringent and in some instances this is so because of substitution for other alloys for which demands will exceed the ability of makers to meet.

Office of Price Administration has granted increases of $7 per gross ton, maximum price, for all grades of silicomanganese, raising the price to $135 per ton for the 1½ per cent carbon grade, on which production currently is being concentrated. While this increase does not restore the normal differential over standard ferromanganese, OPA says it will cover costs and allow a reasonable profit to producers. The increase will have only a negligible effect on cost of producing steel, it is stated.

Pacific Coast . . .

San Francisco—Structural lettings are few. Many fabricators are engaged in prefabricating ship sections. Private work is at a standstill. Western Pipe & Steel Co. has booked 800 tons of plates for rubber pressure tanks for the Dow styrene rubber project in Texas. About 2500 tons in addition is expected to be placed with southern California plate fabricators. Many plants are turning out small sizes of welded steel pipe for defense projects.

Cast iron pipe demand for defense projects has lessened and few private projects are coming out. Few inquiries for reinforcing bars are being released for figures by the Bureau of Reclamation at Denver.

Government projects of size include seven warehouses for a reception center in Pinal county, Arizona, taken by E. W. Duhane Construction Co., Provo, Utah. Albert Reingardt, Long Beach, Calif., was awarded buildings, utilizes and factory training school in Los Angeles county. Del E. Webb Construction Co., Phoenix, Ariz., took a negotiated contract for an air force flexible gunnery school in Mojave county, Arizona. Kenneth Fraser, Pasadena, Calif., was awarded a large contract for a steam distribution system and fuel oil storage facilities for an air depot in San Bernardino county, California.

American Bridge Co. has booked an unstated tonnage for four gate frames for the Keswick dam, California, specification No. 1663D. Bids have been opened on hangars for an Idaho air base and on three hangars for an airfield in Maricopa county, Arizona.

Steel in Europe . . .

Foreign Steel Prices, Page 301

London (*By Cable*)—Demand for steel products in Great Britain is intense, especially for steel alloys, light structurals, heavy plates and sheets. Hematite pig iron is scarce. Scrap supplies continue adequate for steelmaking and foundry needs. Light castings are in quiet demand.

Semifinished . . .

Semifinished Prices, Page 298

War Production Board has granted Wheeling Steel Corp. permission to charge $36 per ton for small billets and $37 for sheet bars produced for lend-lease at its Portsmouth O., plant. Ceiling prices on these products are $34 per ton. The company had asked permission to charge $39.08 and $40.08, respectively. The request for higher base prices on ingots and blooming mill billets and slabs was denied.

Canada . . .

Toronto, Ont.—Canada's expanding war industry is creating new problems in obtaining raw materials. Supply of iron, steel and other metals is the chief concern at the moment, but labor also is causing no little worry. To offset a labor shortage for essential industry, plans are under way whereby selective service officials will have the power to draw men and women from less essential jobs and a new registration of this type of labor is under consideration. There seems little immediate prospect of Canada bettering her position as to steel, although there should be a sharp increase about the end of first quarter next year. Difficulty in obtaining equipment for steel and iron production units from the United States is retarding new installations in this country and furnaces slated to come into production late this year will not be ready until 1943. In the meantime Canada is providing about 60 per cent of requirements of steel and is depending on the United States for the balance.

Merchant ship construction is being given special consideration and it is stated a 10,000-ton ship is being turned out every five days in the Dominion. Plate mills are maintaining production well in excess of rated capacity, with other departments being robbed of steel in the effort. Production of war tanks also is being speeded, creating larger demand for armor plate. Sheets are in heavy demand from war industry and big orders have been appearing recently from the automotive industry engaged on war vehicles and from the electrical trades. It is stated that mills are not accepting orders for either plates or sheets from consumers direct, but only from government sources which are directing deliveries.

Despite the fact that mills are extending efforts to increase bar output, demand is steadily gaining over supply and this situation is expected to be more aggravated as the year advances. In some quarters there is doubt that Canada will be able to make full use of its greatly expanded war production capacity for many months, due to shortage of steel and other metals, and supply of bars is of vital concern. Carbon and alloy bars are in specially heavy demand but other bars also are well below actual needs.

Scrap offerings continued at a brisk pace during the week and receipts by dealers were well above current consumption. Larger quantities of scrap were reported from the rural districts, where farmers have been rushing to get out their accumulations before the deadline for making known or disposing of their holdings, which was advanced to Sept. 30. The rush of the past few weeks has resulted in backing up fairly large stocks in dealers' yards waiting sorting and shipping. Large consumers, such as steel mills and electric furnace interests, are continually adding to plant stocks to carry them through the winter.

Nonferrous Metal Prices

Sept.	Copper: Electro, del. Conn.	Copper: Lake, del. Midwest	Copper: Casting, refinery	Straits Tin, New York: Spot	Straits Tin, New York: Futures
1-30	12.00	12.12½	11.75	52.00	52.00

Sept.	Lead N. Y.	Lead East St. L.	Zinc St. L.	Aluminum 99%	Antimony Amer. Spot, N.Y.	Nickel Cathodes
1-30	6.50	6.35	8.25	15.00	14.50	35.00

F.o.b. mill base, cents per lb. except as specified. Copper and brass products based on 12.00c Conn. copper

Sheets

Yellow brass (high)	19.48
Copper, hot rolled	20.87
Lead, cut to jobbers	9.75
Zinc, l.c.l.	13.15

Tubes

High yellow brass	22.23
Seamless copper	21.37

Rods

High yellow brass	15.01
Copper, hot rolled	17.37

Anodes

Copper, untrimmed	18.12

Wire

Yellow brass (high)	19.73

OLD METALS

Dealers' Buying Prices

(In cents per pound, carlots)

Copper

No. 1 heavy	9.25-10.00
Light	7.25- 8.00

Brass

No. 1 composition	8.50- 9.00
Yellow brass castings	5.50- 6.00
Auto radiators	6.12½-6.62½

Red brass, borings & turnings	8.00- 8.50

Zinc

Old	4.75- 5.00
New clippings	6.00- 6.50

Aluminum

Clippings	9.75-10.25
Cast	8.75- 9.25
Pistons	8.50- 8.75
Sheet	8.75- 9.25

Lead

Heavy	4.75- 5.25

Mixed babbitt	5.35- 5.50
Electrotype shells	5.00- 5.50
Stereotype, Linotype	6.00- 6.75

Tin and Alloys

Block tin pipe	44.00-46.00
No. 1 pewter	32.00-36.00
Solder joints	7.75- 8.50

SECONDARY METALS

Brass ingot, 85-5-5-5, l.c.l.	12.50
Standard No. 12 aluminum	14.50

MAGNESIUM

(12 pound rod, 4 in. diam.)

99.8% ingot, carlots	22.50
100 lb. to carlots	24.50
Extruded sticks, ¼ to 2 lb.	
Carlots	32.00
100 lb. to carlots	34.00

Nonferrous Metals . . .

New York—Total production of munitions is increasing but a better balance in the program must be attained so that available materials can go as far as possible, said Donald Nelson in his latest War Production Report. He said that production of "slow items" must be speeded up and that of "fast ones" slowed down. This indicates that demand for critical materials likely will be heavier in some quarters and lighter in others.

Officials of WPB have indicated that a further drastic reduction in consumption of tin will be effected soon through a complete re-writing of control orders M-43 and M-43-a. Supplies appear adequate, however, for all vital war needs. The new order likely will require further changeover to lead-base bearing alloys in place of tin-base alloys; substitution of tin-lead alloy for tin in coating copper wire; further cuts in use of tin in solders; use of more low-tin or tin-free bronzes and more complete control over tin plate for use in containers.

The government is reluctant to permit increased use of any material except where absolutely necessary, and therefore is reluctant to liberalize the lead conservation order.

Allocation of copper is working out satisfactorily under the program which is expected to be adopted in a modified form for most of the critical materials. The smaller brass foundries face increasing difficulty in securing orders for alloy castings since bulk of copper alloy ingot shipments are going to a relatively few manufacturing concerns.

Urgent war needs still absorb all available supplies of zinc, although small tonnages are still held as reserve to meet unexpected demands.

3/16
3/16
VICTORY CODE
No cuneiform writing, this odd character. It is a code symbol—the code of the welder. Here truly is a victory code, for it is a familiar language in an industry devoted 100% to winning the war. We know that, for we are part of it — and proud of it.
★
MISSISSIPPI VALLEY STRUCTURAL STEEL CO.
MELROSE PARK, ILL. DECATUR, ILL. ST. LOUIS, MO.

E. T. Weir Says Scrap Situation Is Serious

(*Concluded from Page 97*)

hot metal from blast furnaces, is now being used—and there is still available additional capacity for making steel." It is not a question of whether to make steel in the bessemer converter or by using the converter in the duplex process to speed up open-hearth production. "Unless additional supplies of metal become available, no rearrangement of production methods can produce additional tonnage."

"New blast furnace construction is now out of the question because it would take too long to be of any value in the war effort. Our present expansion program which has been under way for a good many months is still far from completion and will not reach completion until late next year. Any additional program which might be started at this time would not be completed in time to be of any importance to our war effort. Therefore, the only answer is in increasing the tonnage of scrap which can be poured into the open hearth furnaces which already exist, and this can be accomplished only by complete co-operation of all American citizens."

New! The Only Drill with a Metered Feed

It Drills a Perfectly Smooth Bottom Surface

CAPACITY:
From No. 68 Drill to ⅛" in Steel
●
Depth Tolerance of .002

● At last! A drill-head that will drill, ream, or counterbore to a predetermined depth and produce a perfectly smooth surface at the bottom of the hole—leaving no burrs or marks where the drill or boring tool leaves the metal.

Unlike other drill-heads, the Sensaumatic is so designed that the drill, instead of being released immediately upon reaching the bottom of the hole, makes several additional revolutions without any forward movement, thus insuring an absolutely smooth bottom surface.

MICHIGAN INDUSTRIAL SALES CO.
131 Duffield Detroit, Mich.

WRITE FOR LITERATURE

SENSAUMATIC DRILL HEAD
PATENT APPLIED FOR

Structural Fabricators Shift to War Work

(*Concluded from Page 115*)

sion that these facilities are not adapted to other uses, Mr. Brooks said, has been the cause of much sales resistance.

Another factor which added to the difficulty was the fact that an urgent need existed for fabricated steel for new war plants and extensions. This kept many shops so busy that, had it been otherwise practical, they were in no position to convert their entire capacity to another type of war work.

Major problems confronting the industry, according to Mr. Brooks, are:

(1) The necessity of gearing the potential unused capacity of the industry to war work.

(2) Regaining the business now yielded to other materials in the interest of the war, when the exigencies of war have ceased.

Mr. Brooks reported a net gain of 17 in the institute's membership.

No Substitute for Steel

Current enthusiasm for "synthetic" construction materials may be excellent to stimulate experiments and may develop some improvements, but steel construction has long proved itself and no substitute will be found for it in post-war construction, in the opinion of V. G. Iden, institute secretary. Restrictions on steel and construction, he said, are having serious effect on these markets which will make the post-war period one of aggressive salesmanship for the industry.

"Deterioration of the highway system is indicative of the post-war planning that must be done now," Mr. Iden declared. "Studies already made indicate that a system of interregional roads must be built at the end of the war amounting to some 30,000 miles, and still more money must be spent on the existing federal highway system of over 200,000 miles to bring those roads back to pre-war efficiency."

T. H. Hendrix, director of statistics for institute, reported that the industry is almost completely dependent upon the government for its current work. This dependency, he said, is coincident with a trend toward larger individual jobs and a decline in small miscellaneous jobs.

"Approximately 82 per cent of our work this year is the result of direct government work; over 79 per cent being for war plant expansion. Government-financed bridges accounted for but 2.2 per cent and government engineering projects less than 0.5 per cent this year, compared with 9.6 per cent and 0.6 per cent in 1941."

Plant Expansion, Construction and Enterprise, Government Inquiries, Sub-Contract Opportunities, Contracts Placed and Pending

SUB-CONTRACT OPPORTUNITIES

Data on subcontract work are issued by regional offices of the War Production Board. Contact either the office issuing the data or your nearest field office. Write, don't telephone, and mention key letters and numbers appearing before each item to assure prompt attention and avoid delay.

Philadelphia Office, Contract Distribution Branch, Production Division, WPB, Broad Street Station building, reports the following subcontract opportunities.

Chase 22-3: Connecticut manufacturer requires indefinitely continued subcontracting facilities for aviation motor components as follows: Breather connection bodies, supercharger drain adapters, diffuser support studs, valve rocker shafts, exhaust valve washers, and main crank case studs, all of SAE 6150 steel, push rod ball ends of SAE 3115 steel and valve tappet rollers of AMS 6440 steel. Material largely bar stock. Tolerances medium and close precision. Quantities various, according to items. Equipment, screw machines or equivalent, light milling machines, drilling, thread rolling, grinding, heat treating, cadmium plating. Prints and specifications at Philadelphia office.

Chase 51-1: New Jersey manufacturer requires indefinitely continued subcontracting facilities for machining aviation engine starter components of approximate dimensions as follows: Bearing ring, 3¾-inch diameter x ¼-inch long and ball race 4 inches diameter and ⅝-inch long, both high carbon, high chrome steel tubing; spline nut, 2½-inch diameter and 1½-inch long, nickel chrome steel; rotor shaft, 2¾-inch disc diameter x 2¾-inch shaft length chrome vanadium bar; intermediate head, 3⅞-inch diameter x 4½-inch long; shaft screw, 2¼-inch diameter x 5⅜-inch long threaded sleeve 2-inch diameter x 4⅜-inch long; bevel gear, 27 teeth, 10 pitch, 2.7-inch P.D., splined shank ⅞-inch diameter x 2⅛ inches long. Latter four items of 5 per cent nickel carburizing steel. Subcontractor to furnish own material. AA-1 priority. Tolerances, medium and close precision. Quantities, varying up to 1000 per month. Equipment or equivalent required, turret lathe, thread miller and grinder, gear shaper, drill press and multi-spindle drill broach, I.D., O.D. and surface grinder, milling machine, lapper, heat treating and magnaflux. Prints and specifications at Philadelphia office.

Cruse 51-1: Pennsylvania concern seeks subcontracting facilities to machine and heat treat 6¼-inch O.D. ball bearings. Half-inch balls and race stock furnished by prime contractor. Tools and fixtures to be built by subcontractor and purchased by prime contractor. Material SAE 1010. Minimum production of 50 bearings per day. Sample and drawing at Philadelphia office.

Esser 23-1: Eastern Pennsylvania concern is seeking subcontracting facilities for machining of heavy gray iron castings. Weights will approximate 10 000 to 12 000 pounds each. Castings are for low, high and intermediate cylinders, pistons and beds for triple expansion engines. Tool requirements include heavy engine lathes, large planers and vertical boring mills. Prints and specifications at Philadelphia office.

Keefer 26-1: Pennsylvania manufacturer seeks subcontracting facilities on body for the M-48 fuze. Material, WDX1314 cold-rolled steel. Tolerances, plus or minus .005. Quantity 25,000 to 50,000 per week. Equipment, 2⅝-inch multi-spindle screw machine. Prints and specifications at Philadelphia office.

Keefer 47-1: Pennsylvania firm needs subcontracting facilities for manufacture of base and adapter. Size of base, 4.290-inch O.D., length 1⅝-inch, weight three pounds. Size of adapter, 2 11/16-inch O.D., length 1 11/16-inch, weight 12 ounces. Forging facilities, turret lathes and multi-spindle automatic screw machines needed. Materials required: Drop forgings and cold-rolled steel, WD1115. Prime contractor can furnish drop forgings if necessary. Quantity, 500 of each per day. Prints, specifications and samples at Philadelphia office. Priorities, AA1, AA2 and A-1-a.

Thompson 48-1: Government needs subcontractor for Johnson light machine gun; 15 000 each of 19 component parts required, up to 1¼ pounds each. Material, steel, SAE 1020, 1045, 3140, 4150 and 4650, spring steel, Shelby tubing. Materials furnished by prime contractor. Equipment, tools, jigs, fixtures and gages, to be quoted separately; drilling, milling, profiling, heat treating, forging, stamping and parkerizing equipment required. Prints at Philadelphia office.

New York office, Contract Distribution Branch of WPB, 122 East Forty-Second street, New York, reports the following subcontract opportunities:

S-177: Upstate manufacturer of ordnance is seeking six-spindle chucking machine and six-spindle Gridley automatic screw machine or No. 5 Warner & Swasey universal turret lathe facilities for the duration on a subcontract order on aluminum fuze body parts. Material, aluminum forgings, which will be furnished. Dimensions, 2.40 x 1.745 inches. Tolerance, plus .005. Quantity, 2000 to 3000 per day for the duration.

S-178: New York city group is seeking additional firms with three or more spindle screw machines of ⅝ to ⅞-inch capacity for manufacture of .50 caliber bullet cores under a pooling arrangement, at satisfactory prices.

S-3371: An upstate New York manufacturer is seeking sources for the production of 21 steel castings weighing approximately 7500 pounds each.

D-47: Brooklyn manufacturer of cutlery instruments for surgical use wants subcontracting facilities in the New York City area to rough forge ⅝-inch bar stock and upset round head only. Material, ⅝ x ⅝ x 7¼-inch No. 420 cutlery stainless steel, will be furnished by prime contractor. Quantity, 3000 plus. Delivery to be a minimum of 800 per week, starting at once.

S-3358: Connecticut manufacturer desires a subcontractor with facilities for making worms and worm gears. Approximate dimensions, 1⅝ inches diameter, 3½ inches long; 1⅝ inches to 2½ inches diameter. Materials, machine steel, bronze and phosphorus bronze. Tolerances, close.

S-3307: Long Island aircraft manufacturer seeks facilities to produce aluminum forgings, either by drophammer or press. Capacity required for forged parts weighing 1½ to 2½ pounds with overall size of 8 to 10 inches, with a base of approximately 6 inches.

D-48: New York hardware manufacturer seeks subcontractors with screw machine facilities for production of large quantity of screws and ferules, to be used in producing knives with interchangeable blades. Two types of screws and two types of ferules are needed. Screws are 1 7/16-inch and 1⅝-inch long, both with tapered and slit heads. Ferules are ⅝-inch long by 7/16-inch diameter and 1 inch long by 7/16-inch diameter. Material, steel. Quantity, 100 000 sets of each type. Priority, A-1-a. Equipment needed, automatic or hand screw machines. Samples at New York office.

S-3364: Facilities are being sought for manufacture of the following instruments: Telescopes, barometers, theodolite instruments, wind velocity instruments.

S-3390: Midwestern manufacturer is seeking subcontracting facilities for casting and machining fuze parts. Material, malleable iron. Dimensions, 1½-inch x ¾-inch bar stock. Equipment, 1½ or 2-inch automatic screw machines. Quantity, 125 000 at rate of 1500 per day, starting in October.

Detroit office, Contract Distribution Branch, Production Division, WPB, Boulevard building, is seeking contractors for the following:

Job. No. 2440: Lower bearing race. Material is ⅝-inch diameter chrome carbon steel, black, which can be furnished. Screw machine, sensitive drill, heat treat, lap hole, external and surface grinder. Requirements are for lots of 8000 and 16,000 on AA-1 priority.

Job No. 2506: Internal grinding on planet carrier. Internal grinding only. 10.75 swing. 7.00 approximate hole size, 1 7/16-inch travel. Order is for 30 to 50 per week on total order of 500.

Job. No. 2507: Internal grinder on steering clutch. Internal grinding only. 11.625 swing. 4.75 approximate hole size—2 33/64-inch travel. Order is for 300 to 500 on deliveries of 30 to 50 per week.

Job No. 2431 and up: Prime contractor has listed requirements on 35 jobs. Material is furnished. Orders are for 50 000 on each job. Priority is AA-1. A few are listed as follows: Plug screw, hub, case, retainer, stop plate, brake disc, housing, thrust plug, bracket, brake spring cover.

Chicago office, Contract Distribution Branch of WPB, 20 North Wacker Drive, is seeking contractors for the following:

Exhibit No. 5: (A) Accessory drive shaft, 8-inch swing, 4-foot centers, heavy duty engine lathe, gun drilling machine 36-inch depth or equal alternate machine, medium size drill press, No. 2 milling machine, bench drill press, external grinder 3-foot centers. Material, AMS 6332 steel furnished by prime, heat treated. Quantity, 500. Tolerances, minimum .0005. (B) Magneto drive coupling. Two-inch capacity hand screw machine, second

operation chucking, small slotting machine, bench drill press, keyseater, external grinder. Material, X335 steel. Quantity, 1000 per month. Tolerances, minimum, .0005. (C) Motor bolt. ½-inch capacity automatic screw machine, screw head slotter, bench drill press, external grinder. Material, AMS 6337 steel, heat treated. Quantity, 12,000 per month. Tolerances, minimum .0005.

STRUCTURAL SHAPES . . .

SHAPE CONTRACTS PLACED

2000 tons, gasoline refinery, Atlantic Refining Co., Philadelphia, to Belmont Iron Works, Philadelphia.

1900 tons, cast house, Pittsburgh Steel Co., Monessen, Pa., to Fort Pitt Bridge Works, Pittsburgh; Freyn Engineering Co., Chicago, engineer; bids Aug. 31.

SHAPE CONTRACTS PENDING

140 tons, viaduct, Franklin avenue, Erie, Pa.; bids to state highway department, Harrisburg, Pa., Oct. 2.

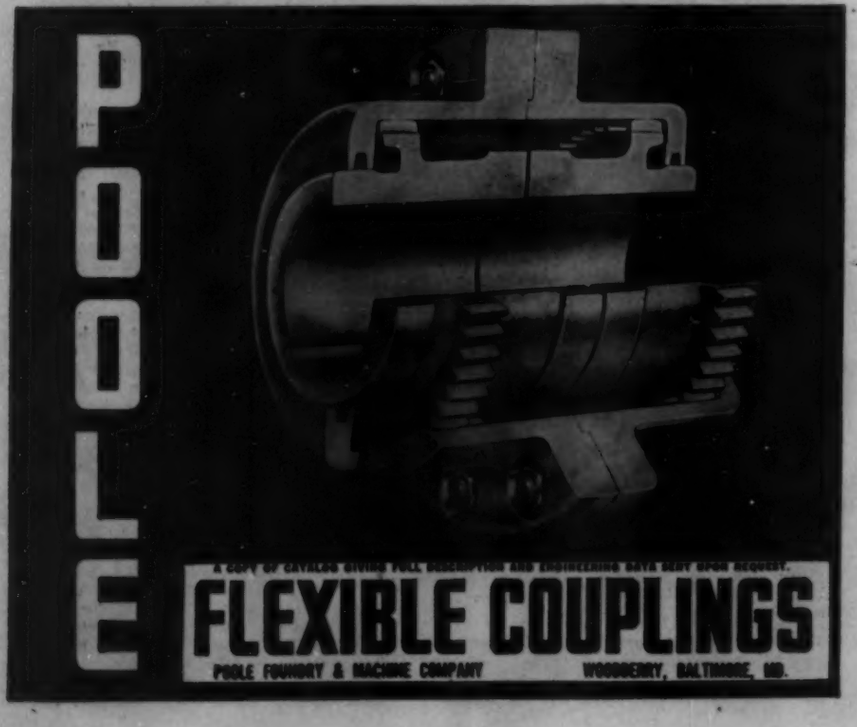
REINFORCING BARS . . .

REINFORCING STEEL AWARDS

350 tons, synthetic rubber plant, Dow Chemical Co., Midland, Mich., to Truscon Steel Co., Youngstown, O.; Austin Co., contractor.

178 tons, miscellaneous buildings, ammunition dump, South Dakota, to Truscon Steel Co., Youngstown O.; Hindel & Rye, contractor.

145 tons, Michigan highway grade separation B-3-82-17-10-A and B, for state, to Ceco Steel Products Corp., Detroit; E. J. Vanderveen, contractor.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FLEXIBLE COUPLINGS
POOLE FOUNDRY & MACHINE COMPANY
WOODBERRY, BALTIMORE, MD.

SHAPE AWARDS COMPARED

	Tons
Week ended Oct. 3	3,900
Week ended Sept. 26	200
Week ended Sept. 19	8,000
This week, 1941	14,786
Weekly average, 1942	18,996
Weekly average, 1941	27,284
Weekly average, August, 1942	8,072
Total to date, 1941	1,127,897
Total to date, 1942	759,827

Includes awards of 100 tons or more.

100 tons, aviation base, Kansas, for United States army, to Ceco Steel Products Corp., Omaha, Neb.; Kiewit & Condon, contractor.

100 tons, expansion, Crucible Steel Castings Co., Milwaukee, to Worden-Allen Co., Milwaukee.

REINFORCING STEEL PENDING

2500 tons, for Philadelphia board of water supply project at Queen Lane; Joseph Lombardi & Son low on general contract; A-1-j priority.

1300 tons, low pumping station for Philadelphia board of water supply at Torresdale; Kaufman Construction Co., low on general contract; A-1-a priority.

131 tons, bridge, Great Lakes Naval Training Station, Great Lakes, Ill.; W. E. O'Neil Construction Co., Chicago, contractor; bids Sept. 28.

100 tons, hospital, East Moline, Ill., for state, Warren B. Ewer Co., Chicago, low on general contract; bids Sept. 4.

PLATES . . .

PLATE CONTRACTS PLACED

800 tons, rubber pressure tanks, Dow styrene synthetic rubber project, Texas; to Western Pipe & Steel Co., San Francisco.

PLATE CONTRACTS PENDING

2500 tons, rubber pressure tanks, Dow styrene synthetic rubber project, Texas; three southern California fabricators, low.

PIPE . . .

CAST PIPE PENDING

547 tons, 2 to 12-inch, water system, Kirkland, King county, Wash., for Federal Works Agency; bids opened.

236 tons, 2 to 8-inch, water system, Annapolis, Kitsop county, Wash., for Federal Works Agency; bids opened.

100 tons, 4 to 8-inch, Pittsburg, Calif.; bids Oct. 6.

RAILS, CARS . . .

BUSES BOOKED

Twin Coach Co., Kent, O.; Twenty 42-passenger for Akron Transportation Co., Akron, O.; four 42-passenger for Youngstown Municipal Railway, Youngstown, O.

CONCRETE BARS COMPARED

	Tons
Week ended Oct. 3	873
Week ended Sept. 26	4,341
Week ended Sept. 19	13,304
This week, 1941	14,051
Weekly average, 1942	8,519
Weekly average, 1941	13,609
Weekly average, August, 1942	7,014
Total to date, 1941	590,264
Total to date, 1942	339,386

Includes awards of 100 tons or more.

CONSTRUCTION AND ENTERPRISE

OHIO

ASHTABULA, O.—Electro-metallurgical Co., 30 East Forty-second street, New York, will build plant financed by Defense Plant Corp. for manufacture of calcium carbide and ferrosilicon. General contract has been let to Turner Construction Co., 420 Lexington avenue, New York.

CANTON, O.—Canton Drop Forging & Mfg. Co., C. A. Brauchler, president and general manager, 207 Twel'th street, is having plans prepared for a $300,000 addition. Firm makes airplane motor cylinder heads and crank cases.

CLEVELAND—Monarch Aluminum Mfg. Co., R. Deutsch, president, 9301 Detroit avenue, has awarded contract to H. L. Vokes Co., 5300 Chester avenue, for a one-story plant, 70 x 204 feet. Estimated cost $50,000.

CLEVELAND—Metal Sprayers Inc. is being incorporated by Lonnie R. Pulliam, as agent, with offices in the Swetland building. Charter permits machining and treating metal.

CLEVELAND—Welded Steel Valve Co. has filed incorporation papers, to manufacture precision products and operate a machine shop. Arthur J. Stack, West Ninety-eighth and Theodore streets, is agent.

CLEVELAND—Welded Construction & Engineering Co., D. E. Benjamin, 2433 Broadway, is seeking 10,000 square feet of space in one-story building for machine shop.

CLEVELAND—Artisan Metal Works Co., J. F. Maynard, president and treasurer, is erecting $11,000 addition to its plant at 11400 Madison avenue.

CLEVELAND—Parker Appliance Co., A. L. Parker, president and treasurer, 17325 Euclid avenue, is building addition to plant at 17301 Olympia road, near the present plant. Cost will be about $25,000 and structure will be used for storage for the aircraft engine fittings factory.

CLEVELAND—H P L Mfg. Co. recently expanded space by 5000 square feet and added equipment. Plant, located at 2015 East Sixty-fifth street, now has 11,000 square feet. K. Peterson is an official of company, which manufactures metal stampings in small lots by special process.

CLEVELAND—National Tool Co., L. A. Schmidt, vice president and chief engineer, will erect two stories on top of present plant at 11200 Madison avenue.

CLEVELAND—National Metal Abrasive Co., H. Marette, secretary, 3560 Norton road, will build a one-story addition costing $50,000.

CLEVELAND—Linderme Tube Co., E. Linderme, president, 1500 East 219th street, has let contract for a 60 x 100-foot plant and office building, including a three-ton overhead crane, to H. E. Klefman Co., 3436 Lorain avenue, estimated to cost about $40,000. E. G. Hoefler, 5005 Euclid avenue, is engineer.

GREENWICH, O.—Centaur Tractor Co., division of LeRoi Corp., Minneapolis, K. E. Gifford, local manager, is adding 5000 square feet to production and service space.

MASSACHUSETTS

HINGHAM, MASS.—United States government has awarded contract for plant for lease to Air Reduction Sales Co., 60 East Forty-second street, New York, to James S. Mozzicato, 168 Mystic avenue, Medford, Mass. Estimated cost $600,000.

SPRINGFIELD, MASS. — American Bosch Corp., 3664 Main street, has let contract for 82 x 90-foot plant addition to E. F. Carlson Inc., 1694 Main street, estimated to cost about $70,000.

WORCESTER, MASS.—Wyman-Gordon Co., 105 Madison street, has let contract for one-story 53 x 120-foot and 80 x 100-foot shop, warehouse and factory buildings to E. J. Cross Co., 150 Prescott street; electrical work to Scrimgeour Electric Co., 41 Central street. Estimated cost is $200,000.

PENNSYLVANIA

GENEVA, PA.—Fraser-Bruce Engineering Co. Inc., New York, has been awarded a $5,000,000 contract by the War Department for an extension to the Keystone ordnance plant, near here. Work will be under supervision of United States engineers from the Pittsburgh office.

LANGELOTH, PA. — Climax Molybdenum Corp., M. W. Murphy, superintendent, has awarded contract for engineering and construction of plant addition to Rust Engineering Co., Clark building, Pittsburgh. Estimated cost $500,000.

MONACA, PA.—Superior Steel Products Co., M. P. Simpson, purchasing agent, has let contracts for one story 60 x 300, 120 x 300 and 100 x 120-foot additions to John J. Brooks & Son, 2538 Eighth avenue, Beaver Falls, Pa. Estimated cost over $100,000.

PHILADELPHIA—Philco Corp., Tioga and C streets, will build a 50 x 102-foot plant C and Ontario streets. M. Ward Easly, 1201 Chestnut street, is engineer.

PITTSBURGH—Vulcan Detinning Co., Neville Island, E. S. Dewey, plant superintendent, has let contract for a one-story 50 x 300-foot addition to the Pittsburgh-Des Moines Steel Co.,

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Neville Island.

PITTSBURGH—Mine Safety Appliance Co., J. F. Beggs, vice president and secretary, 300 North Braddock avenue, has let general contract for two and three-story addition to Navarro Corp., 6210 Broad street. Prack & Prack, 517 Martin building, are architects.

MICHIGAN

DEARBORN, MICH.—Dearborn Stamping Co. has let contract to Talbot & Meier, Detroit, for an addition to its factory. J. E. Clapp, Detroit, is architect.

DETROIT—Aluminum Co. of America has awarded contract for an addition to its boiler plant to Stibbard Construction Co., Detroit. Malcomson, Calder & Hammond Inc., Detroit, are architects.

DETROIT—City council has approved $300,000 appropriation for a city salvage plant to recover annually approximately 30,000 tons of scrap steel, iron, tin and glass now being buried by department of public welfare.

DETROIT—Weld Tool Co., 7723 West Warren avenue, has been incorporated with $50,000 capital to operate a general welding and heating business, by Philip L. Bourque, 7723 West Warren avenue.

DETROIT—Kopec Engineering Co., 17113 West Six Mile road, has been incorporated with $50,000 capital to deal in tools, gages and machined parts by Stanley J. Kopec, 474 Pearson avenue, Ferndale, Mich.

DETROIT—Twentieth Century Engineering Co., 6000 Beniteau avenue, has been incorporated with $100,000 capital to manufacture dies, tools, gages and jigs by Charles P. Rabaut, 1173 Whittier avenue, Grosse Pointe, Mich.

MIDLAND, MICH.—Dow Chemical Co. has awarded contract to Stone & Webster Inc., 49 Federal street, Boston, for a plant to be built in Texas at cost of $18,000,000.

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ILLINOIS

CHICAGO—Hills-McCanna Co., 2349 West Nelson street, manufacturer of lubricators, valves, chemical pumps, is adding to plant to increase production of magnesium alloys.

CHICAGO—Charles H. Milles Foundry Co., 2225 West Thirty-fifth street, is expanding manufacturing space for production of gray iron castings.

CHICAGO—Chicago Chemical Co., 6221 West Sixty-sixth place, is building new plant on southwest side to house a specific manufacturing process for which present facilities are not adequate.

CHICAGO—Lindberg Engineering Co., 2450 West Hubbard street, manufacturer of heat treating and other industrial furnaces, is building an addition to increase production.

CHICAGO—American Generator & Armature Co., 2614 West Forty-eighth street, manufacturer of automotive and aircraft generators, is erecting a warehouse addition.

CHICAGO—Midwest Well Supply Co., 341 North Pulaski avenue, manufacturer of water well supplies, at present working on war contracts, is building a factory at another location, to house its entire operations.

CHICAGO—Harrison Sheet Steel Co., 4718 West Fifth street, fabricator of sheet steel products, is building an addition to accommodate increased war business.

CHICAGO—Pressed Steel Car Co. Inc., East 136th street and South Brandon avenue, has three extensions of plant capacity under way. Two main buildings are 700 and 900 feet long.

ALABAMA

BIRMINGHAM, ALA.—Johnston & Jennings, Cleveland, will operate detinning plant to be erected by H. K. Ferguson Co., Hanna building, Cleveland, financed by Reconstruction Finance Corp. at estimated cost of $1,000,000.

GEORGIA

ATLANTA, GA.—United States engineer, Marietta, Ga., received bids Oct. 2 for construction of boiler plant building at Marietta aircraft assembly plant. Plans by Robert & Co., Bona Allen building, Atlanta.

KENTUCKY

CATLETTSBURG, KY.—Ashland Oil & Refining Co., Paul C. Blayer, president, has plans for an oil refinery here.

TENNESSEE

NASHVILLE, TENN.—United States engineer, 306 United States courthouse, Nashville, has let contract for a sewage treatment plant in Cumberland county to Rule & Murphy Co., Memorial Apartments, Nashville, to cost $50,000 to $100,000.

NORTH CAROLINA

HIGH POINT, N. C.—W. R. Holway and associates, Robert E. Lee hotel, Winston-Salem, N. C., have been retained by Federal Works Agency to redesign and supervise construction of High Point hydroelectric project on Yadkin river near Winston-Salem, to cost about $8,000,000. Priority not yet granted.

SOUTH CAROLINA

CHARLESTON, S. C.—United States engineer, 33 Customhouse, has plans for an air force installation at North Charleston, to cost over $3,000,000.

LOUISIANA

NEW ORLEANS, LA.—New Orleans Public Service Co., 317 Baronne street, is having plans prepared for an addition to its steam electric station at Market and St. Peter's streets and installation of additional equipment. Cost about $180,000, exclusive of equipment. Ebasco Services Inc., 2 Rector street, New York, is consulting engineer.

POLLOCK, LA.—United States engineer, postoffice building, Vicksburg, Miss., plans an air force installation to cost over $2,000,000.

WEST VIRGINIA

CHARLESTON, W. VA.—Federal Foundry & Supply Co., 4600 East Seventy-first street, Cleveland, will build a two-story 60 x 190-foot factory, 20 x 40-foot warehouse and 14 x 30-foot office building, costing about $65,000. H. M. Morse Co., 1500 East Superior avenue, Cleveland, is engineer.

CLARKSBURG, W. VA.—Hope Natural Gas Co. of West Virginia, L. L. Tonkin, president, 445 West Main street, Clarksburg, plans construction of $42,000,000 pipe line, 1000 miles, 20-inch pipe, connecting Hope system at Kentucky border to Louisiana and Texas. Capacity 285,000,000 cubic feet natural gas daily to steel industry in Pennsylvania, West Virginia and Ohio.

MISSOURI

ST. LOUIS—Allen Tool Co., George Allen, proprietor, 5148 Natural Bridge avenue, has opened a plant for manufacture of custom tools, with 15,000 square feet of floor space.

ST. LOUIS—Premier Tool & Mfg. Co., L. S. and R. D. Golterman, owners, 3149 Locust street, has been organized to process forgings for war use. The machine shop has 2000 square feet production space.

ST. LOUIS—McQuay-Norris Mfg. Co., W. K. Norris, president, 2320 Marconi street, is building a one-story addition for foundry and factory use, with 19,884 square feet floor space.

ST. LOUIS—Watlow Electric Mfg. Co., Louis Desloge, president, 1320 North Twenty-third street, is building a two-story addition, increasing floor space 3000 square feet, at a cost of $8500. Company manufactures heating elements for industrial use.

ARKANSAS

LITTLE ROCK, ARK.—United States engineer, Gay building, Little Rock, has awarded contract for a sewage disposal plant to Joseph J. Duffy Co., 176 West Adams street, Chicago, to cost about $50,000.

MINNESOTA

MINNEAPOLIS—Electric Machinery & Mfg. Co., 1331 N. E. Tyler street, has let contract for a plant addition to Dean L. Witchter, 544 Builders Exchange building, estimated to cost about $40,000, including equipment.

ARIZONA

RILLITO, ARIZ.—Elizalde & Co. Ltd., 405 Montgomery street, San Francisco, will build cement plant of 1000 to 1200 barrels capacity three miles south of Rillito. F. De la Guardia is president.

UTAH

SALT LAKE CITY, UTAH—Utah Oil & Refining Co. has authorization of War Production Board to build aviation gasoline refinery adjoining its present plant, to supply Army and Navy needs.

CALIFORNIA

LOS ANGELES—Pittenger & Batterton Machine Co., 2449 East Fifty-sixth street, has been formed by H. W. Pittenger and Robert A. Batterton, both of Los Angeles.

LOS ANGELES—Hughes Aircraft Co., 11900 West Florence avenue, is erecting two new factory buildings covering 30 x 72 feet and 87 x 90 feet, to cost $20,000.

LOS ANGELES—Weber Tool Co., 4200 Whiteside avenue, is building an addition 30 x 36 feet, to cost $1200.

LOS ANGELES—Hydraulic Press & Engineering Co., 5535 Alba street, is having plans drawn for a machine shop 39 x 119 feet, costing $6500.

CANADA

ETOBICOKE, (TORONTO) ONT.—A. C. Wickman (Canada) Ltd., 69 Yonge street, Toronto, tool maker, etc., has given general contract to Milne & Nicholls Ltd., 57 Bloor street West, for construction of plant addition here to cost, with equipment, about $35,000. Arthur Heeney, Jr., 73 Boustead avenue, Toronto, architect.

FORT WILLIAM, ONT.—Canadian Car & Foundry Co. Ltd., 621 Craig street West, Montreal, has given general contract to Claydon Co. Ltd., for construction of plant addition here, estimated to cost, with equipment, about $60,000.

GALT, ONT.—Babcock-Wilcox & Goldie-McCulloch Ltd., 64 Grand avenue, steam power plant equipment, etc., has had plans prepared for plant addition and alterations to cost with equipment, about $25,000. Equipment will include Link Belt Speeder Ls-40 tractor crawler crane; four 300 ampere Wilson Hornet 550 volt. 24 cycle, electric welding machines; No. 508 Chicago steel press brake, etc.

HAMILTON, ONT.—Burlington Steel Co. Ltd., Sherman avenue North, is having plans prepared by Prack & Prack, architects, 36 James street South, for construction of plant addition, estimated to cost with equipment, about $50,000.

NEW TORONTO, ONT.—Citadel Merchandising Co. Ltd., 696 Cathcart street, Montreal, a government owned company, has given general contract to M. S. Soules, 2 Toronto street, Toronto, for construction of machinery building here to cost about $200,000.

LONDON, ONT.—Beatty Bros. Ltd., Chelsea Green, implements, machinery, etc., has given general contract to Roy James Construction Co., 1054 Colborne street, for construction of plant addition, one story, 30 x 250 feet, to cost with equipment, about $50,000.

TORONTO, ONT.—Potts Pattern Works Ltd., 94 Peter street, is considering plans for construction of plant addition, estimated to cost, with equipment, about $35,000.

TORONTO, ONT.—Fairgrieve & Son Ltd., 44 Dovercourt road, dies, washing machines, etc., has given contract to Bradford-Horshal, 1170 Yonge street, for construction of plant addition, to cost, with equipment, about $55,000.

TORONTO, ONT.—John Inglis Co. Ltd., 14 Strachan avenue, has awarded number of subtrades in connection with construction of new plate shop and Bren gun assembly plants, at total cost of approximately $900,000. General contract awarded to A. W. Robertson Ltd., 57 Bloor street West, and work is proceeding on foundations.

TORONTO, ONT.—Gray Forgings & Stampings Ltd., 710 St. Clarens avenue, has given general contract to R. G. Kirby & Son Ltd., 539 Yonge street, and construction work will start immediately on plant addition to cost, with equipment, about $100,000. Building to be one story, 60 x 100 feet. Margison & Babcock, 210 Dundas street West, consulting engineers.

WEST LORNE, ONT.—Erie Flooring & Wood Products Ltd., has had plans prepared and will start work immediately on new plant building and alterations to existing plant, and installation of additional new equipment, to cost about $25,000.

WESTON, ONT.—Massey-Harris Co. Ltd., 915 King street West, Toronto, has extended contract given to A. W. Robertson Ltd., 57 Bloor street West, Toronto, to include construction of large addition to aircraft plant at Main street North, here. Plans are being prepared by Allward and Gouinlock, architects, 57 Bloor street West, Toronto, and work will be started as soon as possible. Estimated cost, with equipment, about $500,000.

LONGUEUIL, QUE.—Dominion Engineering Works Ltd., First avenue, Lachine, Que., is having plans prepared and tenders will be called soon for construction of another new plant building and oil storage, estimated to cost, with equipment, about $125,000.

MONTREAL, QUE.—Steel Co. of Canada Ltd., 525 Dominion street, is calling for tenders through Brian R. Perry, consulting engineer, 680 Sherbrooke street West, for construction of addition to welding rod plant on Notre Dame street West, estimated to cost, with equipment, about $80,000. Plans call for building two stories, 37 x 150 feet.

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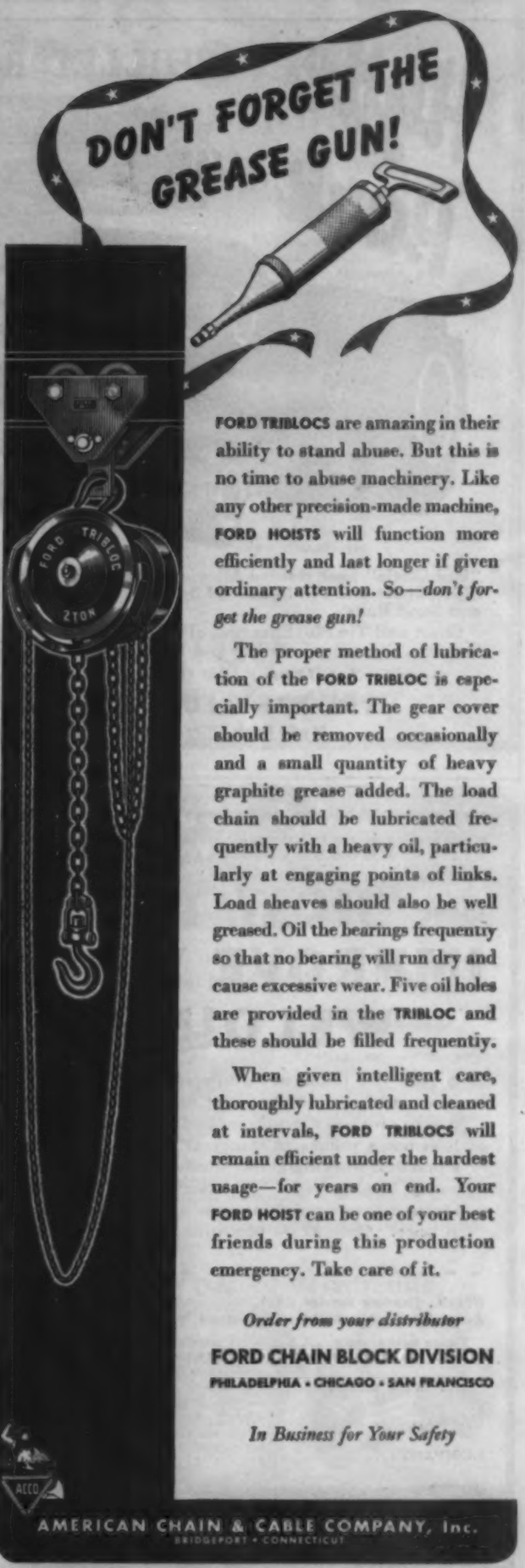

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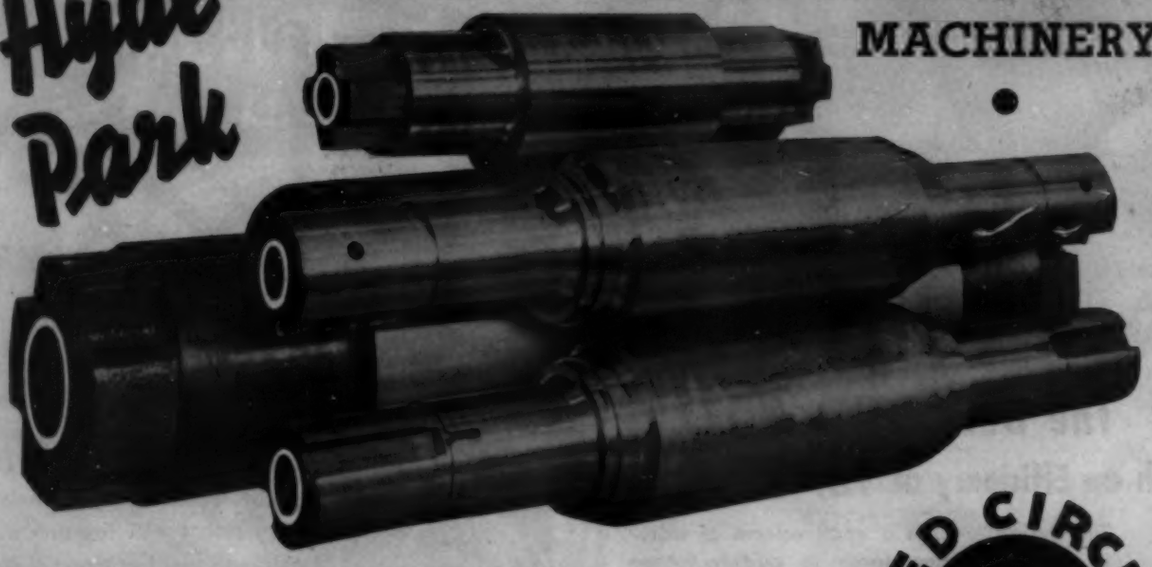

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TYPE: Air Hardening Hot Work Dies
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TYPE: Oil and Water Hardening
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PURPOSE: Dies for bomber parts.

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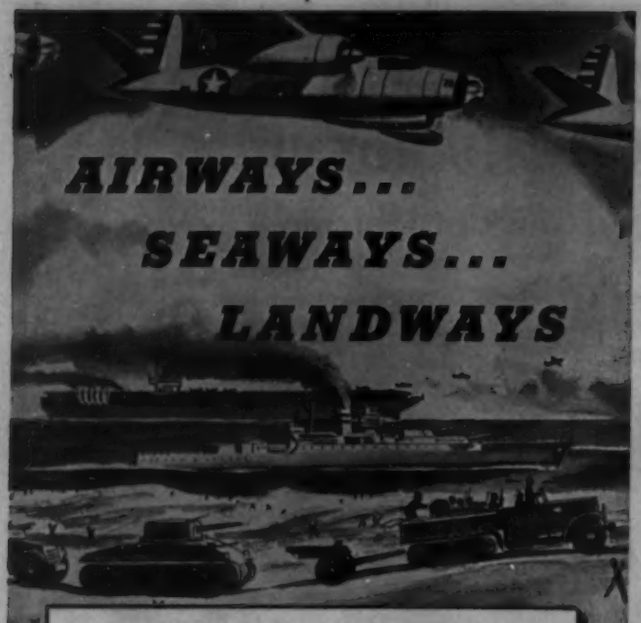

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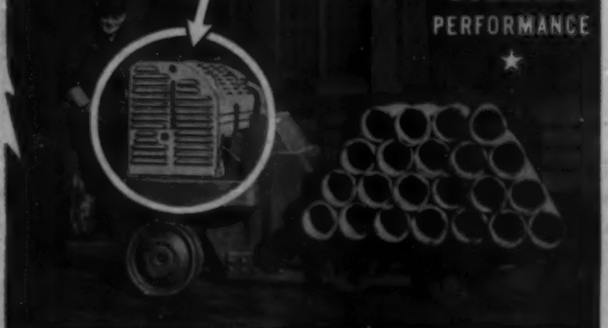

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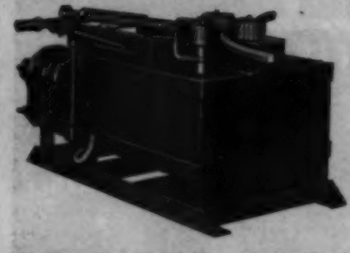

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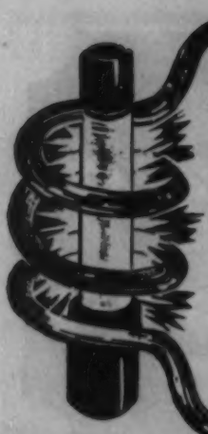

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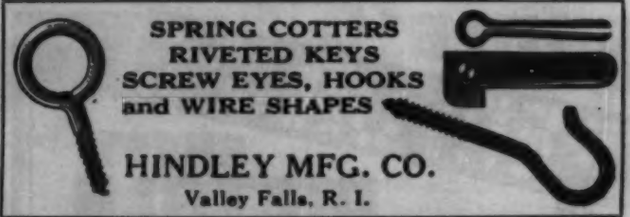

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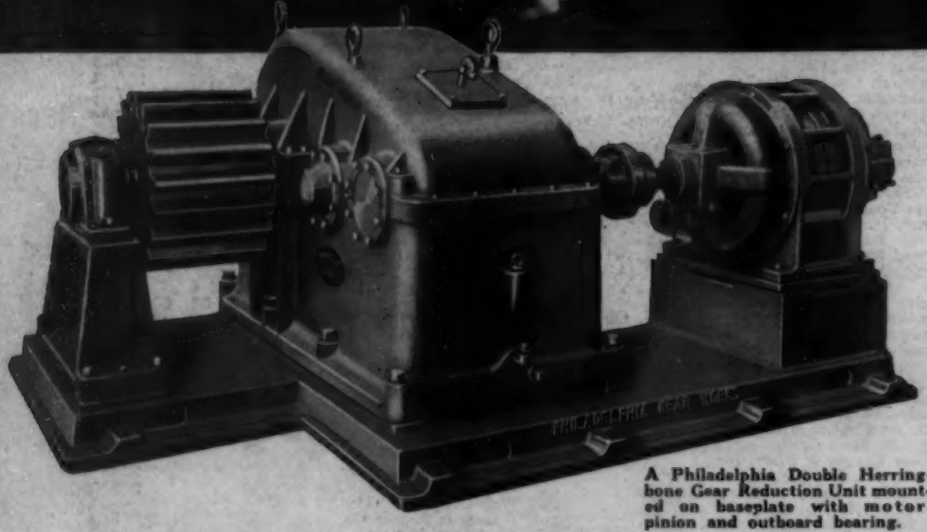

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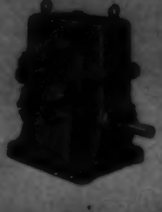

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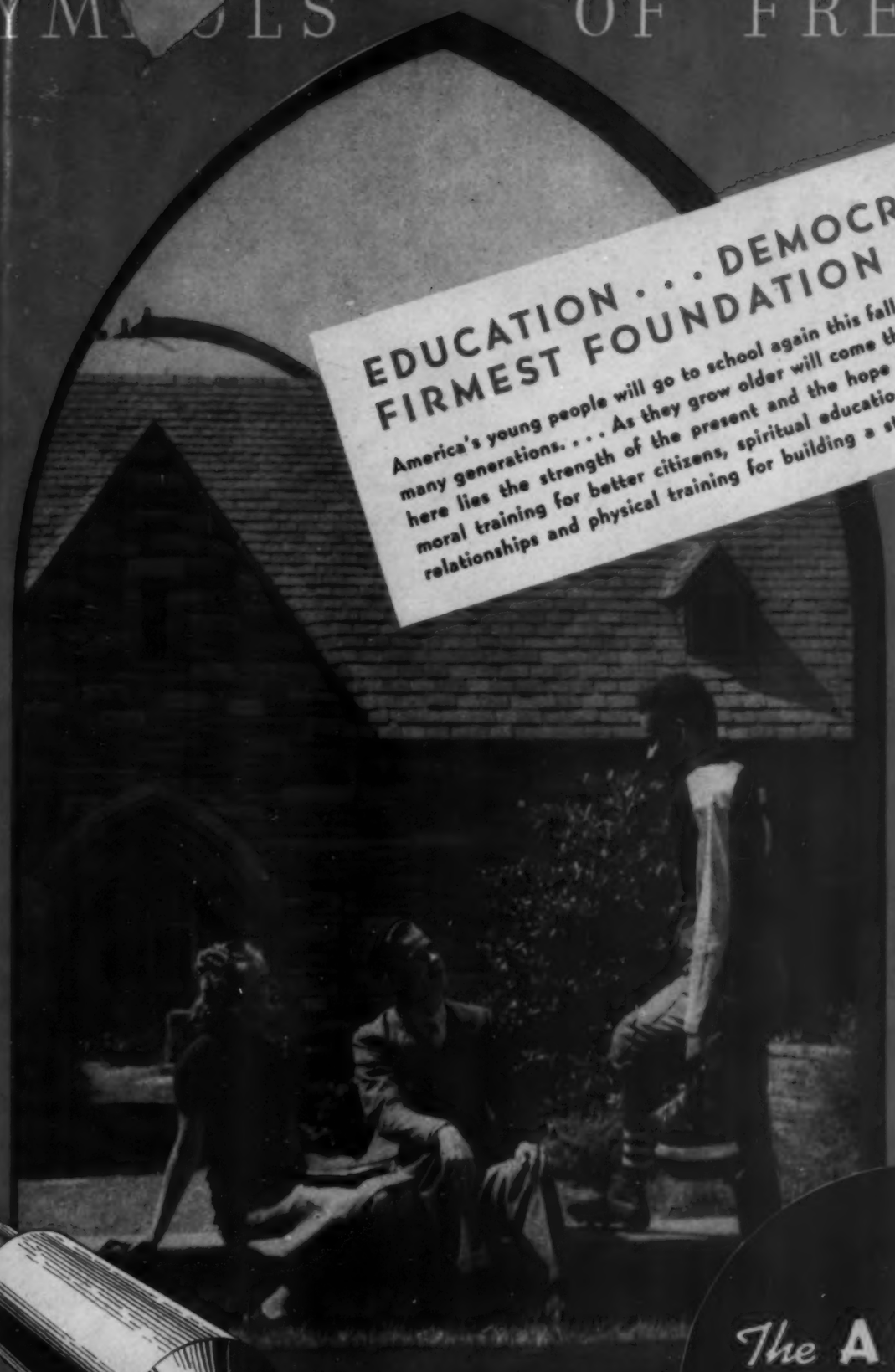

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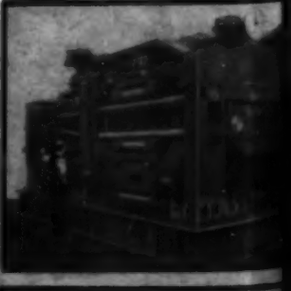

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SPECIALISTS IN SHEET, TIN and STRIP MILL EQUIPMENT

Associated Companies

Lee Wilson Engineering Co.
CLEVELAND, O.

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The McKay Machine Co.
YOUNGSTOWN, O.

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Flinn & Dreffein Co.
CHICAGO, ILL.

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The Wellman Smith Owen Engr. Corp., Ltd.
LONDON, ENGLAND

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The Hallden Machine Co.
THOMASTON, CONN.

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The Wean Engineering Co. of Canada, Ltd.
HAMILTON, ONT.

The WEAN

ENGINEERING CO., INC.

WARREN, OHIO

SUBSIDIARY COMPANY

THE BRODEN CONSTRUCTION CO., CLEVELAND, O.

Mfgrs. of Strip and Wire Mill Machinery